

**MECHANISMS OF SOCIAL COGNITION IN EARLY EPISODE
PSYCHOSIS**

by

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Abstract

The mental abilities required to identify, understand, and respond to social information are broadly referred to as social cognition, and individuals with schizophrenia spectrum disorders display significant impairments in these abilities. Social cognition has been identified as a primary contributor to functional outcomes in psychosis, and represents a critical target for treatment and recovery. Although previous research has extensively examined the magnitude of social cognitive impairments across phases of psychosis using a variety of measures, the factors that contribute to social cognition are still relatively unknown, but may hold the key to improve our understanding of why these impairments arise and persist over time. Because traditional measures of social cognition place demands on neurocognitive and motivational resources, it was hypothesized these illness-related factors would be implicated in the social cognitive performance of individuals in the early stages of a psychotic disorder. In two studies, tasks of social cognition were experimentally manipulated to assess for the influence of cognitive biases and amotivation on performance in a sample of early psychosis patients ($n = 35$) and demographically-matched community controls ($n = 35$). Results from these studies demonstrated that jumping to conclusions, a cognitive bias common to psychosis, and extrinsic motivators during testing were directly associated with outcomes on tasks of social cognition, and that these factors were particularly relevant to the performance of the early psychosis group. These studies add to the existing literature on social cognition in psychosis by emphasizing the role of jumping to conclusions and amotivation, which may be informative for refining the theoretical model of social cognition and enhancing interventions designed to remediate these impairments. Moreover, the functional relevance of social cognition highlights the importance of ongoing research efforts using experimental designs to better understand the illness-related factors most strongly associated with social cognition in psychosis.

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Table of Contents

Abstract	ii
Acknowledgements	iii
List of Figures	viii
List of Tables	ix
Chapter 1 General Introduction.....	1
1.1 Objectives	1
1.2 Features of Psychosis	2
1.2.1 Symptom Dimensions	2
1.2.2 Diagnostic Considerations	3
1.2.3 Phases of Psychosis.....	4
1.2.4 Illness Trajectory.....	6
1.3 Early Intervention in Psychosis.....	8
1.3.1 Remission and Recovery.....	9
1.4 Functioning and Predictors of Outcome in Early Psychosis	11
1.4.1 Neurocognition	12
1.5 Social Cognition in Early Psychosis	14
1.5.1 Emotion Perception.....	16
1.5.2 Social Perception and Knowledge	17
1.5.3 Theory of Mind	18
1.5.4 Attributional Styles or Biases	19
1.5.5 Summary of Performance across Domains	20
1.6 Onset and Course of Social Cognitive Impairments in Psychosis	21
1.6.1 Theoretical Explanations for the Onset of Impairments	21
1.6.2 Course of Impairments.....	22
1.7 Correlates of Social Cognition in Early Psychosis	23
1.7.1 Psychotic Symptoms	23
1.7.2 Neurocognition and Functioning	24
1.8 Conceptual and Methodological Issues in the Study of Social Cognition	26
1.9 Goals of the Proposed Research.....	28
Chapter 2 Jumping to Social Conclusions in Early Episode Psychosis	30
2.1 Introduction.....	30
2.2 Method	34

2.2.1 Participants.....	34
2.2.2 Measures	35
2.2.2.1 Demographics	35
2.2.2.2 Psychiatric history.....	36
2.2.2.3 Psychiatric symptoms	36
2.2.2.4 Estimated premorbid intelligence	36
2.2.2.5 Neurocognition.....	36
2.2.2.6 Social cognition.....	37
2.2.2.7 Jumping to conclusions.....	38
2.2.2.8 Global functioning	38
2.2.3 Procedure	39
2.2.4 Data Analysis	42
2.3 Results.....	43
2.4 Discussion.....	45
2.4.1 Overview of Findings.....	45
2.4.2 JTC and BADE	46
2.4.3 Neurocognition and Symptoms.....	47
2.4.4 Performance Differences between Patients and Controls	49
2.4.5 Strengths and Limitations	50
2.4.6 Clinical Implications and Future Research	52
2.4.7 Conclusions.....	53
Chapter 3 Money Talks: The Influence of Extrinsic Motivators on Social Cognition in Early Episode	
Psychosis.....	60
3.1 Introduction.....	60
3.2 Method	63
3.2.1 Participants.....	63
3.2.2 Measures	64
3.2.2.1 Demographics	64
3.2.2.2 Psychiatric history.....	64
3.2.2.3 Psychiatric symptoms	65
3.2.2.4 Estimated premorbid intelligence	65
3.2.2.5 Neurocognition.....	65
3.2.2.6 Social cognition.....	66
3.2.2.7 Self-perception of social cognition	66

3.2.2.8 Global functioning	66
3.2.3 Procedure	67
3.2.4 Data Analysis	68
3.3 Results.....	69
3.4 Discussion.....	71
3.4.1 Overview of Findings.....	71
3.4.2 Monetary Rewards and Effort.....	73
3.4.3 Corrective Feedback and Learning	75
3.4.4 Performance Differences between Patients and Controls	76
3.4.5 Limitations and Future Research	77
3.4.6 Clinical Implications	79
3.4.7 Conclusions.....	81
Chapter 4 General Discussion.....	89
4.1 Summary of Study Goals and Research Findings.....	89
4.2 Theoretical Implications	91
4.3 Clinical Implications	94
References.....	99
Appendix A Research Ethics Board Approval.....	127

List of Figures

Figure 2.1. Sample Response Form for the Modified Version of the IPT-15.....	54
Figure 2.2. Group by Time Point on Mean Accuracy Scores on the Modified IPT-15	56
Figure 2.3. Group by Time Point on Mean Confidence Ratings on the Modified IPT-15.....	57
Figure 2.4. Group by Time Point on Mean Amount of Additional Information Needed on the Modified IPT-15	58
Figure 3.1. Group by Condition Interaction Effect for TASIT Total Scores	86
Figure 3.2. Group by Condition Interaction Effect for ‘Don’t Know’ Responses.....	87
Figure 3.3. Proposed Progression of ToM Abilities Across Stages of Psychotic Illness.....	88

List of Tables

Table 2.1. Demographic and Clinical Characteristics of Study Participants	55
Table 2.2. Correlations between Draws to Decision, Social Cognition, and Clinical Characteristics for Early Psychosis Patients	59
Table 3.1. Demographic and Clinical Characteristics of Study Participants	82
Table 3.2. Demographic and Clinical Characteristics of Study Participants as a Function of Group and Condition Type	83
Table 3.3. Partial Correlations between TASIT Total Scores and Clinical Characteristics of Study Participants while adjusting for Condition Type (Reward vs. Non-Reward)	84
Table 3.4. Means and Standard Errors for TASIT Measures as a function of Group and Condition Type after controlling for Estimated Premorbid Intelligence and Global Neurocognition	85

Chapter 1

General Introduction

1.1 Objectives

Schizophrenia spectrum disorders are among the most debilitating illnesses worldwide, characterized by profound and persistent impairment in multiple domains of everyday functioning (Bowie et al., 2010). Although neurocognitive impairment has consistently displayed a significant relationship with poor functional outcomes in psychosis, social cognition is gaining widespread acceptance as a more proximal predictor of functioning, accounting for greater variance than neurocognition (see Fett, Viechtbauer, Penn, van Os, & Krabbendam, 2011 for a review). Social cognition refers a set of cognitive processes that underlie social interactions. A variety of assessments from other research disciplines have been increasingly applied to study social cognition in psychotic disorders. However, these assessments were originally developed for non-clinical populations, which has resulted in measures with inadequate psychometric properties that may not fully capture the social cognitive difficulties specific to psychosis. Moreover, the measurement issues inherent in tasks of social cognition brings into question the validity of the deficits reported and the degree to which social cognitive tasks are independent of other effects common to a psychotic illness.

Therefore, the overarching goal of the proposed research was to better understand the illness-related factors that underlie and contribute to social cognitive performance in the early stages of psychosis. In order to accomplish this goal, tasks of social cognition were experimentally manipulated to examine whether performance could be modified by the manipulation of factors other than social cognitive abilities. Previous research has demonstrated social cognition's relationship with neurocognitive abilities, cognitive biases, and motivation levels of patients. The proposed research aims to delineate the degree to which social cognitive performance in early psychosis reflects these other illness-related factors rather than true deficits in social cognition.

Exploring other factors that are hypothesized to be strongly associated with performance on social cognitive tasks has implications for the study and treatment of early psychosis. Findings from the proposed research could provide a better understanding of the phenomena implicated in successful social cognitive performance. Additionally, this research could inform relevant treatment targets for improving social cognition and functioning in the early stages of a psychotic illness.

1.2 Features of Psychosis

1.2.1 Symptom Dimensions

Psychosis refers to an abnormal mental state characterized by distortions in thinking and perception that cause a loss of contact with reality. The primary clinical features of psychosis are broadly categorized into positive and negative symptom dimensions, which are experiences that reflect *an excess of* or *a deficit in* normal behaviour, respectively (American Psychiatric Association, 2013). Positive symptoms of psychosis include delusions, hallucinations, and disorganized speech and behaviour. Delusions are erroneous beliefs that are held with conviction and impervious to change, even in the face of compelling disconfirmatory evidence. These beliefs differ from strongly held ideas in that they are highly implausible and/or bizarre, and not rooted in ordinary life experiences or shared by others within the same sociocultural context. Hallucinations are experiences of perception in the absence of external stimuli, and can occur in any of the five sensory modalities (auditory, gustatory, olfactory, tactile, and/or visual), with auditory hallucinations being the most frequently reported (Tandon, Nasrallah, & Keshevan, 2009). Disorganized speech is often denoted by a loosening of associations that manifest in idiosyncratic word usage (e.g., incoherence, neologisms) and/or disjointed communication (e.g., derailment, circumstantiality, tangentiality). In addition to illogical speech patterns, motor behaviour can also present as bizarre, unpredictable, and/or grossly disorganized, resulting in challenges with goal-directed behaviour and activities of daily living.

Negative symptoms of psychosis fall into two separate but related subdomains: *diminished expressivity* and *amotivation* (Foussias & Remington, 2008). Diminished expressivity is often observed

through affective blunting or flattening, poverty of speech, and/or reductions in non-verbal features of communication, such as eye contact, vocal intonation, and facial/body gestures. Amotivation refers to displays of apathy (lack of interest or concern), avolition (lack of initiative or persistence), and anhedonia (lack of pleasure or reward experiences). These motivational deficits are functionally-relevant features of psychosis, given their strong association with social withdrawal and challenges in academic or occupational settings.

1.2.2 Diagnostic Considerations

Psychosis, while not a formal diagnosis, is a term used by mental health professionals to describe a collection of symptoms that can be identified in a variety of clinical disorders. According to the Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5), an episode of psychosis comprises two or more symptoms of (1) delusions, (2) hallucinations, (3) disorganized speech, (4) grossly disorganized or catatonic behaviour, and (5) negative symptoms, with at least one symptom present from the first three symptom groups (American Psychiatric Association, 2013). The duration of a psychotic episode can range from a brief disturbance that occurs for as short as one day with an eventual full return to premorbid functioning to persistent disturbances that are present for more than six months, with at least one month of active symptoms. The diagnostic criteria also emphasize the significant impact that symptoms must have on domains of everyday functioning.

Given the diversity of symptom profiles, the presentation of psychosis and progression of illness varies considerably among individuals. Although schizophrenia is one of the most recognizable severe mental illnesses with psychosis as a defining feature, symptoms of psychosis can be found in a spectrum of related illnesses, including brief psychotic disorder, delusional disorder, schizophreniform disorder, and schizoaffective disorder. These diagnostic categories are distinguished by the severity and duration of psychotic symptoms, and each category has a distinct course of illness and outcome. For instance, delusional disorder falls on the lower end of the spectrum in terms of severity, and is characterized by the presence of one or more delusional beliefs without other accompanying symptoms of psychosis.

Schizoaffective disorder, however, reflects a more severe form of illness given that psychotic symptoms co-occur with mood symptoms, such as depression or mania. The duration of symptoms is also associated with distinct diagnostic categories. Along the duration continuum, the presence of psychotic symptoms for less than a month, less than six months, or beyond six months are a defining criterion for: brief psychotic disorder, schizophreniform disorder, and schizophrenia, respectively.

Further complicating the clinical picture of psychosis is the transdiagnostic and dimensional nature of symptoms. Up to 50% of individuals with a psychotic disorder meet criteria for at least one other psychiatric condition (Green, Canuso, Brenner, & Wojcik, 2003), with anxiety, mood, and substance abuse disorders being the most common comorbidities (Buckley, Miller, Lehrer, & Castle, 2009). Notably, there is substantial overlap with psychotic and affective symptoms, and individuals whose psychosis is accompanied by few affective symptoms (i.e., non-affective psychosis) are differentiated from those whose psychosis is preceded by or concurrent with episodes of depression and/or mania (i.e., affective psychosis). Additionally, the conceptualization of psychosis has undergone a major paradigm shift in recent years given that symptoms are increasingly being viewed as experiences that fall on a continuum for all individuals, ranging from minimal and transient perceptual disturbances to diagnosable clinical disorder. According to van Os, Linscott, Myin-Germeys, Delespaul, and Krabbendam (2009), approximately 8% of the general population will have true psychotic experiences, 4% will experience clinically meaningful distress and seek help for these experiences, and 3% will meet criteria for a diagnosable psychotic disorder. Therefore, provision of a clinical diagnosis is not solely based on the presence of psychotic symptoms, but also depends on the persistence, degree of functional impairment, and subjective distress associated with these experiences (American Psychiatric Association, 2013).

1.2.3 Phases of Psychosis

Defining the exact time of onset of psychosis can be a challenge due to the deviations in thinking patterns and behaviour that invariably precede overt symptoms. Individuals who eventually develop a psychotic disorder often follow a sequential trajectory that involves a premorbid and prodromal phase of

illness prior to the first episode of psychosis. The premorbid phase is defined as a period of stable and mild cognitive and behavioural abnormalities, with accompanying impairments in academic and social functioning, which can often long precede the onset of psychosis (Davidson et al., 1999). The prodromal phase is characterized by its lack of stability in that individuals experience a range of subthreshold disturbances in affect, cognition, and behaviour, lasting from weeks to several years, that can spontaneously remit or progressively worsen over time (Iyer et al., 2008). During a period referred to as the “early” prodromal phase, individuals exhibit symptoms of psychopathology that are nonspecific to psychosis (e.g., depression, anxiety, irritability, and sleep disturbances), in addition to the initial signs of negative symptoms (e.g., social withdrawal/isolation and progressive declines in academic or occupational achievement). These experiences are typically followed by attenuated positive symptoms, which emerge approximately one year before psychosis onset in the “late” prodromal phase, and include perceptual abnormalities, odd beliefs or magical thinking, delusional ideas, and suspiciousness (Larson, Walker, & Compton, 2010). A few months prior to the formal onset of psychosis, attenuated positive symptoms increase in their frequency, duration, and intensity, and gradually evolve into transient episodes of psychosis that spontaneously remit within a few hours to several days (Meyer et al., 2005).

Greater severity of prodromal symptoms is considered the best predictor of conversion to a psychotic disorder (Cannon et al., 2008). Among individuals identified at clinical high risk for psychosis based on their prodromal symptoms, approximately 22% develop full symptoms and convert to a psychotic disorder within one year, and 36% convert after three years (Fusar-Poli et al., 2012). While no single symptom is pathognomonic of psychosis, ongoing disturbances in reality testing and conviction regarding the veracity of these experiences marks the formal onset of psychosis. In general, a first psychotic episode typically occurs between late adolescence and early adulthood, with a peak age of onset between 18-30 years (Tandon et al., 2009). The prevalence of psychotic disorders is equal for men and women (Saha, Chant, Welham, & McGrath, 2005); however, males display symptoms at an earlier age than females, with the age of onset occurring on average about five to seven years later in females

(Tandon et al., 2009). An earlier age of onset is associated with worse premorbid functioning, greater symptom severity, and poorer long-term prognosis (DeLisi, 1992).

1.2.4 Illness Trajectory

There is considerable heterogeneity in the trajectory and outcome of the early stages of psychosis, which broadly refers to the first five years of illness (Birchwood, Todd, & Jackson, 1998). This is a period during which patients often reach a plateau in terms of psychopathology and disability from psychosis, and deterioration appears to stabilize, and may even subside, amongst those who initially display the greatest level of decline (Birchwood et al., 1998). Support for this “plateau effect” comes from earlier studies that reported almost half of first episode patients (46%) exhibited no active psychotic symptoms after five years of illness (Scottish Schizophrenia Research Group, 1992), and 35% of patients from another first episode sample displayed minimal impairment five years post-discharge (Shepherd, Watt, Falloon, & Smeeton, 1989).

Diagnostic reliability for psychotic disorders can be difficult to achieve, especially during the early stages when the longitudinal stability of clinical symptoms is still unclear. For instance, baseline diagnoses in a sample of 500 patients hospitalized for a first episode of psychosis included a majority (61.6%) of affective psychotic disorders, such as bipolar disorder with psychotic features or major depressive disorder with psychotic features, followed by fewer diagnoses (38.4%) of non-affective psychotic disorders, such as schizophrenia spectrum conditions (Salvatore et al., 2009). Over a two-year follow up period, diagnoses changed in 22.4% of patients, and these shifts were primarily attributed to the later manifestation of affective symptoms. Because symptoms tend to evolve after first hospitalization, provisional diagnoses are frequently provided at initial presentation, and more definitive diagnoses are given after a 12- to 18-month period of clinical observation (Cotter, Zabel, French, & Yung, 2017). However, another study following a sample of 470 first episode patients over a 10-year period reported changes in 50.7% of baseline diagnoses, suggesting there may be substantially higher rates of misclassification beyond two years after first hospitalization (Bromet et al., 2011).

Symptom dimensions of psychosis tend to follow an independent, non-linear course. Positive symptoms appear in the acute phase of illness and fluctuate over time, with periods of symptom exacerbation alternating with periods of remission. Symptom exacerbations can be triggered by psychosocial stressors, substance abuse, or treatment nonadherence (Tandon et al., 2009). Negative symptoms, however, become more prominent as the length of illness increases, and remain stable for individuals who experience chronic psychosis (Kring, Gur, Blanchard, Horan, & Reise, 2013). Although positive symptoms are generally more responsive to antipsychotic treatment, negative symptoms are largely resistant to pharmacological interventions and more strongly associated with functional outcomes (Bowie, Reichenberg, Patterson, Heaton, & Harvey, 2006).

During the early stages of illness when clinical and functional deterioration appears to plateau (Lieberman et al., 2001), there is high risk for relapse and rehospitalization, which can interrupt the acquisition of practical skills necessary for daily living and further complicate the process of restoring functioning to premorbid levels (Rinaldi et al., 2010). The progressive declines in functioning that are observed in the prodromal phase of illness become comparatively worse once psychotic symptoms fully manifest. Even with optimal antipsychotic treatment and remission of positive symptoms, functional deterioration persists within the first two to five years of psychosis onset (Srihari, Shah, & Keshavan, 2012), but stabilizes following this period (Menezes, Arenovich, & Zipursky, 2006).

The degree of functional impairment in the early course of illness appears to be related, in part, to the duration of untreated psychosis (DUP). DUP refers to the period of time between the onset of active symptoms and the initiation of appropriate clinical intervention, and has been shown to be predictive of inferior clinical and functional outcomes that persist for years following a first episode of psychosis (Harris et al., 2005). Furthermore, DUP has gained traction as an important prognostic factor for psychotic disorders, and its association with the course and outcome of illness provides a compelling rationale for the universal adoption of earlier intervention practices.

1.3 Early Intervention in Psychosis

The potential for improving clinical and functional outcomes through timely, evidence-based approaches has garnered international attention over the past two decades and propelled the movement for early intervention in psychosis (McGorry, Edwards, Mihalopoulos, Harrigan, & Jackson, 1996). Presently, early intervention has become a mainstream component of psychiatric care worldwide (Marshall & Rathbone, 2011), and is predicated on an extensive literature base that suggests the initial years following the onset of psychosis represent a critical period when treatment is maximally effective (Birchwood et al., 1998). Therefore, the overarching goal of early intervention is to reduce the length of DUP through access to early detection and intensive treatment of emergent psychotic symptoms and related psychopathology.

For over a century, there had been limited consideration for reforming clinical services and the timing of interventions given that schizophrenia and related psychoses were conceptualized as having a progressively deteriorating course with inevitably poor prognosis (McGlashan, 1998). However, accumulating clinical research has challenged these historical assumptions and instilled a more optimistic view that psychosis is not an inherently degenerative condition (McGorry, Killackey, & Yung, 2008), but rather an episodic illness (Harrison et al., 2001), and that full recovery from psychosis, defined as symptom remission and restoration of functioning, is possible (Torgalsbøen & Rund, 2002).

It is now well-established that efforts to treat psychotic symptoms and functional impairment during this early critical period can significantly alter the course of illness by reducing relapse and attenuating long-term disability (Bird et al., 2010). Specialized services for early psychosis have demonstrated superior clinical and functional outcomes that are sustained over time compared to treatment as usual (Craig et al., 2004; Kane et al., 2016; Petersen et al., 2005). Unlike standard models of care which rely on case management to target crisis resolution, relapse management, and rehabilitation after clinical stabilization (Srihari et al., 2012), specialized services for early psychosis emphasize a multidisciplinary, team-based approach to deliver comprehensive and phase-specific interventions, even when individuals may be actively symptomatic (Álvarez-Jiménez, Parker, Hetrick, McGorry, & Gleeson,

2009). In these specialized services, a variety of pharmacological (Robinson, Woerner, Delman, & Kane, 2005) and psychosocial (Killackey, Jackson, & McGorry, 2008; Petersen et al., 2005; Tarrier et al., 2004) treatments have been developed and tailored to the unique clinical needs of patients in the early stages of illness to support their personal recovery goals.

Although the benefits of specialized services for early psychosis have been documented for up to two years, there is still uncertainty regarding the long-term durability of benefits once patients are transferred to regular care (Bertelsen et al., 2008). Recent evidence has highlighted the importance of continuity of specialized services for up to five years to maintain treatment gains (Norman et al., 2011), and ongoing research continues to investigate the optimal duration of these services (Lutgens et al., 2015).

1.3.1 Remission and Recovery

Pharmacological interventions are often regarded as the first line treatment for psychotic symptoms, and symptom remission remains a treatment priority and cornerstone of early intervention programs. Criteria for remission have been adopted from Andreasen et al. (2005) and are now generally accepted as attaining a low intensity level of symptoms in which the core domains (positive, negative, and disorganized symptoms) do not significantly interfere with behaviour for a minimum duration of six months. Remission rates of psychotic symptoms are uniformly high after the initiation of treatment, with 75% of first episode patients achieving remission during the first six months of antipsychotic medication, and up to 80% of patients achieving sustained remission after one year (Penn, Waldheter, Perkins, Mueser, & Lieberman, 2005). While pharmacological interventions can effectively treat psychotic symptoms, remission rates appear to decline after a five-year period (47.2%; Robinson, Woerner, McMeniman, Mendelowitz, & Bilder, 2004), and medication alone does not produce clinically meaningful improvements in functional outcomes (Swartz et al., 2007).

Functional impairment is a hallmark feature of psychotic disorders and represents another major barrier to full and sustained recovery. There is now a greater understanding that patients in the early stages of psychosis not only prioritize education and employment as treatment goals (Ramsay et al.,

2011), but also endorse these goals more frequently than symptom relief (Iyer, Mangala, Anitha, Thara, & Malla, 2011). Therefore, the traditional concept of “recovery,” which was previously exclusively based on a reduction or absence of symptoms, has been replaced by a definition that moves beyond symptom remission to also include the attainment of meaningful roles in society (Ventura et al., 2011). Interest in functional remission has emerged due to the growing appreciation of recovery goals that include input from patients (Wunderink, Sytema, Nienhuis, & Wiersma, 2008), in addition to the higher proportion of individuals with psychotic disorders now living outside the hospital and independently in the community with consequent opportunities to function (van Os & Kapur, 2009). With this updated conceptualization of recovery, full recovery from psychosis refers to an extended period of improvement in clinical symptoms and adequate levels of functioning, broadly defined as the fulfillment of age-appropriate role expectations (Robinson et al., 2004). Given that functioning is recognized as a multifaceted construct, the field has attempted to identify critical elements of functional remission, which include: (a) full- or part-time involvement in work or school, (b) independent living and performance of daily living tasks without supervision, and (c) regular engagement in social interactions with peers or recreational activities, all of which should be sustained for a two-year period (Lieberman, Kopelowicz, Ventura, & Gutkind, 2002).

A key outcome from the early intervention movement has been an increased appreciation for a multidisciplinary approach to treatment and the utility of combining pharmacotherapy with psychosocial interventions to better target functional disability (Breitborde, Moe, Woolverton, Harrison-Monroe, & Bell, 2018). Even with an emphasis placed on addressing the functional needs of patients with early psychosis, contemporary research has repeatedly shown that rates of functional remission are disproportionately lower than rates of symptomatic remission (Tohen et al., 2000; Ventura et al., 2011). A review of 37 longitudinal outcome studies indicated that 42% of patients with first episode psychosis achieve favourable functional outcomes, while 35% display incomplete social or functional remission (Menezes et al., 2006). Current estimates of full recovery from early psychosis (i.e., symptomatic and functional remission for a duration of >2 years) are more optimistic, with a pooled prevalence reported at 38% ($n = 9,642$ patients, 35 studies, $M = 7.2$ year follow-up; Lally et al., 2017). Nevertheless, because a

substantial portion of patients still do not fully recover from a first episode of psychosis, often due to persistent functional difficulties, identifying the barriers to achieving sustained functional remission holds significant potential for recovery from psychosis and advancing the field of early intervention.

1.4 Functioning and Predictors of Outcome in Early Psychosis

Functional impairment is a criterion that is common to all clinical diagnoses in the DSM-5; however, the level of impairment and its associated burden are central features of psychosis that differentiates it from other psychiatric conditions (Jobe & Harrow, 2005). The disability that results from psychosis is stable, even when symptoms improve, and spans multiple domains, including social, occupational, and residential functioning (Harvey et al., 2011). For instance, individuals with schizophrenia spectrum disorders exhibit a diminished ability to maintain social and romantic relationships, acquire gainful employment, and live independently, which can interfere with community integration (Bellack et al., 2006), limit the achievement of functional milestones (Harvey et al., 2012), and place a considerable economic burden on family members, healthcare systems, and society as a whole (Knapp, Mangalore, & Simon, 2004).

The timing of illness onset provides some explanation for the broad and persistent functional impairment associated with psychosis. Given that a first psychotic episode often appears during late adolescence or early adulthood, many individuals are still in the process of acquiring the fundamental skills to lead independent and productive lives. The emergence of symptoms during this critical period disrupts healthy developmental trajectories and has detrimental effects on social and vocational functioning (Niendam, Jalbrzikowski, & Bearden, 2009). Consequently, research efforts are increasingly focused on the early identification and treatment of factors that contribute to impairments in everyday functioning to prevent a trajectory of accumulating disability and improve the long-term outcomes of patients in the early course of illness.

1.4.1 Neurocognition

Neurocognitive abilities have been extensively studied in psychotic disorders, and much of this attention has been generated because of the strong associations documented between multiple domains of neurocognition and functional outcomes. There is now overwhelming evidence that difficulties in attention, verbal learning and memory, processing speed, visuospatial abilities, and executive functions are pervasive and closely linked to everyday functioning for individuals with schizophrenia spectrum disorders. Even in the early stages of psychosis, neurocognitive difficulties are already widespread and reliably observed. A meta-analysis reported that first episode patients perform approximately 0.5 to 1.5 standard deviations below healthy controls across a range of neurocognitive domains, which is consistent with medium to large impairments (Mesholam-Gately, Giuliano, Goff, Faraone, & Seidman, 2009). It is important to note the magnitude of these impairments vary across domains and also within groups, given that some patients display better performance on specific neurocognitive tasks (e.g., attention) than others (e.g., verbal learning and memory). Nevertheless, impairments in neurocognition are regarded as stable, core features of psychotic disorders that are associated with functional outcomes to an even greater extent than clinical symptoms (Bowie et al., 2008) across the early and chronic stages of illness (Green, Horan, Mathis, & Wynn, 2013).

Research has shown that neurocognitive deficits are robust predictors of functioning, both cross-sectionally (Green, 1996) and longitudinally (Green, Kern, & Heaton, 2004), with global measures of neurocognition accounting for 20–60% of the variance in everyday functional outcomes for patients (Green, Kern, Braff, & Mintz, 2000). However, functioning is likely influenced by factors other than neurocognition, as evidenced by the large amount of variance (e.g., 40–80%) unaccounted across studies. Indeed, the pathway from neurocognition to functional outcomes is more complex and indirect than originally described. Recent studies have reported that metacognition (Lysaker et al., 2010), social cognition (Schmidt, Mueller, & Roder, 2011), negative symptoms (Ventura, Helleman, Thames, Koellner, & Nuechterlein, 2009), motivation (Gard, Fisher, Garrett, Genevsky, & Vinogradov, 2009), and functional capacity (Bowie et al., 2006) all serve as mediating factors that account for additional, mediated, or unique variance in functioning. These findings highlight the direct and indirect effects of

illness-related factors on functioning, and the need to further elucidate these complex associations to better understand functional outcomes in psychosis and target the difficulties more proximal to actual everyday behaviours. Moreover, identifying the most proximal direct and indirect variables has important implications for early functional recovery since it could lead to improved interventions aimed at ameliorating functional impairments following a first episode of psychosis.

One of the most consistent and proximal determinants of functional outcome for individuals with psychosis has been social cognition (Schmidt et al., 2011). The study of social cognition has resulted in numerous publications and become a high priority topic in psychotic disorders over the past two decades (Green et al., 2008). Given the proliferation of interest and research in this area, investigators have now shifted from examining *whether* social cognition is a functionally relevant feature of psychosis to *how* and *why* social cognition is functionally relevant, and under which contexts and circumstances. While it is generally accepted that social cognition is more closely linked to functional outcomes for patients with psychosis than neurocognition, very little is understood about the illness-related factors that underlie and contribute to social cognitive abilities, and if these factors play a pertinent role in how well individuals perform on tasks of social cognition. Most tasks of social cognition used in psychosis research have been borrowed from other fields that originally examined these abilities in healthy populations or non-psychotic clinical samples, and therefore may lack sensitivity to subtle deficits in psychosis (Dodell-Feder, Lincoln, Coulson, & Hooker, 2013) or do not fully capture the social situations or problems that individuals with psychosis encounter (Yager & Ehmann, 2006). An overview of the most reliable and robust findings to date across domains of social cognition will be addressed, with an emphasis on studies that have examined social cognition in early psychosis, their limitations, and directions for future research.

1.5 Social Cognition in Early Psychosis

Social cognition is a term that originated from social psychology during the late 1960s and early 1970s, when researchers were attempting to explain the association between attitudes and behaviours but

were limited by existing theoretical models and terminology (Rutter & Quine, 2002). Broadly speaking, social cognition referred to “understanding how people understand themselves, the worlds (physical, social, environmental) around them, and their relationship with those worlds” (Augoustinos, Walker, & Donaghue, 2014, p. 15), and drew heavily from the methods and concepts of cognitive psychology. Although behaviourism was the dominant theory for understanding human behaviour until the mid-twentieth century, an appreciation grew for the role of cognition and its influence on behaviour. Behaviourists insisted that an observable stimulus produced an observable response and that intervening cognitions were irrelevant; however, cognitive psychologists later proposed that experiences from the external world contribute to the organization, processing, and responding of social information, and that subjective interpretations of social stimuli are highly relevant for developing frameworks for understanding and influencing behaviour (Fiske & Taylor, 2008).

Social cognition reflects a process that is fundamentally cognitive and relies on the assumption that the experience of the world is ultimately constructed by the perceiver (Fiske & Taylor, 2008). Therefore, unlike non-social cognition, which refers to basic mental operations that can be applied to social situations (e.g., attention and memory retrieval), social cognition is more concerned with *how* these mental operations are applied, based on intrapersonal factors, such as biases, motives, values, and situational contexts, all of which can impact what is perceived, and how it is processed and subsequently acted upon.

Although various definitions have been proposed over the years, social cognition is now regarded as a set of cognitive processes that contribute to the accurate identification and interpretation of the thoughts, beliefs, and intentions of others in social situations (Couture, Penn, & Roberts, 2006). Importantly, these processes assist individuals in navigating social cues to guide appropriate behaviours, and are critical for success in interpersonal relationships and overall social functioning (Savla, Vella, Armstrong, Penn, & Twamley, 2012). The challenge with establishing a universally-accepted definition of social cognition is that it is not considered a unitary construct, but rather an approach or philosophy that is ultimately determined by the research discipline (Augoustinos et al., 2014). Moreover, different

aspects of social cognition are emphasized in different disciplines. According to Fiske and Taylor (2008), researchers in social psychology focus their efforts on four common areas: *mentalism* (i.e., the cognitive representations which organize our knowledge, values, attitudes, and beliefs, and shape our behaviours), *process* (i.e., automatic or implicit processes vs. controlled processes, such as non-social cognition), *cross-fertilization* (i.e., incorporation of interdisciplinary approaches, such as neuroimaging), and *real-world issues* (i.e., social problems, such as stereotyping and prejudice). In contrast, researchers studying social cognition in the context of clinical psychology tend to narrowly examine the cognitive abilities and processes that lead to problems in social behaviour for individuals with mental illness. The application of social cognition to psychotic disorders has been reliably investigated since the 1980s and 1990s (Savla et al., 2012), and one of the first papers to synthesize early findings of social cognition in schizophrenia advocated for further research in this area to elucidate the processes that contribute to impairment in social functioning and better understand the etiological origins of psychotic disorders (Penn, Corrigan, Bentall, Racenstein, & Newman, 1997). Subsequent work by Green and colleagues (e.g., Green, Olivier, Crawley, Penn, & Silverstein, 2005; Green et al., 2008) have become influential in standardizing definitions of social cognition and highlighting its relevance to clinical outcomes in psychotic disorders. Within the psychosis literature, a multidimensional approach has been applied to the study of social cognition, and five key domains have been identified by a consensus of experts in the field. These domains include: (1) *emotion perception*, (2) *social perception*, (3) *social knowledge*, (4) *theory of mind*, and (5) *attributional styles or biases* (Green et al., 2008). Descriptions of these social cognitive domains will be reviewed below, in addition to common assessment measures and performance across these domains for individuals with early psychosis.

1.5.1 Emotion Perception

Emotion perception (also referred to as emotion recognition or affect perception and recognition) involves perceiving and recognizing emotions in others, and the ability to use information from facial

expressions and/or vocal inflections to understand what another person is feeling (Green et al., 2008). Measures of emotion perception often require respondents to identify or discriminate between a range of emotional states in standardized photographs, audiotaped/videotaped monologues, or hypothetical vignettes. Although stimuli used to assess emotion perception vary in their visual complexity as well as the number and type of non-verbal cues available, patients with early psychosis reliably display poorer performance on global measures of facial and vocal emotion perception compared to healthy controls (Amminger et al., 2012; Bediou et al., 2007; Thompson et al., 2012). However, the emotional valence of stimuli appears to be related to accuracy on measures of emotion perception. A subgroup of studies investigated performance across different emotional states and found that early psychosis patients exhibit specific deficits in the recognition of negatively-valenced emotions compared to healthy controls, with deficits being particularly salient for fear and sadness in both facial and vocal modalities (Amminger et al., 2011; Edwards, Pattison, Jackson, & Wales, 2001). Research comparing early psychosis patients to those with chronic psychosis are mixed, with some studies indicating that deficits on global measures of facial or vocal emotion perception for early psychosis patients are equivalent to (Comparelli et al., 2013; Leung, Lee, & Lee, 2011; Pinkham, Penn, Perkins, Graham, & Siegel, 2007) or, in some cases, less pronounced (Comparelli et al., 2011; Kucharska-Pietura, David, Masiak, & Phillips, 2005) than deficits in chronic patients. Additionally, no consistent pattern of impairment has been detected between early and chronic psychosis groups at the specific emotion level (Kucharska-Pietura et al., 2005; Romero-Ferreiro et al., 2016). With respect to the longitudinal stability of emotion perception deficits in early psychosis, there is evidence that facial emotion perception performance is reliable at three-month (Hill et al., 2008) and one-year (Addington, Saeedi, & Addington, 2006; Horan et al., 2011) follow-up periods, irrespective of whether changes in clinical symptoms occur.

1.5.2 Social Perception and Knowledge

Social perception refers to the ability to decode and interpret social information in others

(Green et al., 2008). Social knowledge refers to the awareness of social expectations (i.e., roles, rules, and goals) that help govern social behaviour in various contexts, and relies on intact social perception (Green et al., 2008). Given the conceptual overlap between these two categories, both are often merged into one domain of social perception and knowledge to streamline research activities (Pinkham et al., 2013). Measures of social perception and knowledge require respondents to use verbal and non-verbal cues to make inferences about ambiguous or complex social situations (Green et al., 2008). These measures typically use pictorial stimuli, such as comic strips and drawings, or vignettes that are written or videotaped, and respondents are asked to form impressions about features of social situations, such as the nature of the relationship between conversational partners. Few studies have examined social perception and knowledge in early psychosis, but the literature to date suggests that early psychosis patients display deficits in performance compared to healthy controls (Addington et al., 2006; Green et al., 2011), and these group differences persist even after controlling for general intelligence (Bertrand, Sutton, Achim, Malla, & Lepage, 2007) or working memory (Montreuil et al., 2010). Although the magnitude of social perception and knowledge deficits has been shown to be similar for patients in the early and chronic stages of illness, there are inconsistencies across studies. For instance, Green et al. (2011) reported that early episode patients displayed greater deficits in social perception and knowledge than chronic patients, yet this unexpected finding did not reach statistical significance when a correction for multiple analyses was applied. Another study conducted by Addington et al. (2006) noted comparable performance for early and chronic patients on measures of social perception and knowledge; however, the chronic group was defined as being ill for at least three years, which obfuscates the interpretation of the results given the limited difference in duration of illness between the two groups (Healey, Bartholomeusz, & Penn, 2016). Longitudinal studies have shown that deficits in social perception and knowledge are stable over a one year period for early psychosis patients (Horan et al., 2011), even with significant improvement in positive symptoms (Addington et al., 2006).

1.5.3 Theory of Mind

Theory of mind (ToM) involves the understanding that others have mental states that differ from one's own, and the ability to infer the content of those mental states (i.e., the intentions, dispositions, and beliefs of others; Green et al., 2008). Measures to evaluate ToM abilities are largely borrowed from the developmental psychology literature, and have been extended to individuals with psychosis due to the overlapping deficits in ToM observed in autism and schizophrenia spectrum disorders (Green et al., 2008). ToM is typically assessed using first- and second-order tasks. First-order mentalizing tasks involve simplistic inferences about a character's mental state, whereas second-order mentalizing tasks involve more complex inferences about the mental states of two or more characters during their social interactions (Healey et al., 2016). Because mental state attributions are made on the basis of several sources of information, a variety of measures exist to evaluate first- and second-order ToM (Achim, Guitton, Jackson, Boutin, & Monetta, 2013). Common measures of ToM include written or verbal stories about the false beliefs or intentions of characters, cartoon/picture sequencing tasks, silent animated videos depicting interactions between abstract stimuli, videos of dynamic social scenarios with rich verbal and non-verbal information, and other visual tasks that rely on cues from facial features to ascertain different mental states (Healey et al., 2016).

There is evidence that ToM performance in early psychosis may be differentially related to level of task complexity. Studies have shown that patients display intact first-order abilities on measures that utilize cartoons and/or short stories, but poorer performance on more complex second-order measures (Achim, Ouellet, Roy, & Jackson, 2012; Ho et al., 2015; Inoue et al., 2006). Nevertheless, the use of isolated facial features, such as the eye region of faces, to make inferences about a character's mental state is a first-order ToM ability that is reliably impaired in patients relative to healthy controls (Couture, Penn, Addington, Woods, & Perkins, 2008; Kettle, O'Brien-Simpson, & Allen, 2008; Mazza et al., 2013). These findings highlight that individuals with early psychosis are able to accurately identify the mental states of another person, but that challenges with ToM arise when they are required to mentalize about multiple conversational partners in social situations or when limited social cues are available.

Compared to healthy controls, early psychosis patients exhibit robust deficits in ToM that are evident across a range of second-order measures, including tasks that assess mentalizing abilities in verbal stories (Thompson et al., 2012), picture sequencing with cartoon images (Landgon, Still, Connors, Ward, & Catts, 2014), and videos of abstract visual stimuli (Koelkebeck et al., 2010; Ventura et al., 2015) or dynamic social scenarios (Bliksted, Fagerlund, Weed, Frith, & Videbech, 2014; Green et al., 2011). When comparing early psychosis patients to those with chronic psychosis, both clinical groups perform similarly on measures of ToM that use verbal stories (Mazza et al., 2012; Vohs et al., 2014), images of the eye region to make mental state attributions (Vohs et al., 2014), or videos of dynamic social scenarios that use non-literal language, such as irony, sarcasm, and deception (Green et al., 2011). Moreover, according to meta-analytic research, by the first episode of psychosis the magnitude of ToM impairment ($d = 1.0$; Bora & Pantelis, 2013) is comparable to that of chronic patients ($d = 1.1$; Bora, Yucel, & Pantelis, 2009) across a variety of measures. The stability of ToM in early psychosis has also been documented at six-month (Ventura et al., 2015) and one-year (Horan et al., 2011) follow-up periods, regardless of changes in positive symptoms (Sullivan et al., 2014), which suggests that deficits in ToM are persistent over time and unrelated to clinical status.

1.5.4 Attributional Styles or Biases

Attributional styles refer to the different explanations, including internal, external, or situational, that individuals draw upon to make interpretations about positive or negative life events (Green et al., 2008). The literature differentiates internal attributions (i.e., causes due to oneself) from external attributions (i.e., causes not due to oneself), and external attributions are further categorized as being either external personal attributions (i.e., causes attributed to other people) or external situational attributions (i.e., causes attributed to situational factors; Green et al., 2008). Examining these attributional styles is particularly relevant in the context of psychotic disorders given that patients with persecutory delusions use more external personal attributions to explain negative events compared to remitted patients and healthy controls (Martin & Penn, 2002). The tendency to attribute negative outcomes to other people,

rather than situations, is known as a *personalizing bias*, which is associated with persecutory symptoms (An et al., 2010) and has a direct influence on social judgments (Green et al., 2008). Moreover, individuals guided by this line of reasoning may also be prone to attribute ambiguous events to hostile intentions of others (i.e., *a hostile attributional bias*) or arrive at hasty conclusions when forming impressions about others and fail to incorporate contextual social information (i.e., *jumping to conclusions bias*; Kern & Horan, 2010). Attributional styles are assessed using hypothetical situations on self-report measures, and respondents are often asked to generate explanations for the occurrence of various events. Few empirical studies have examined attributional styles in early psychosis, and the results have been somewhat inconsistent (Healey et al., 2016). When presented with ambiguous hypothetical situations, early psychosis patients perceived significantly greater hostility in the intentions of others relative to healthy controls (An et al., 2010). However, one study reported discrepancies in the attributional styles of early psychosis patients with the use of different measures (Humphreys & Barrowclough, 2006), and another noted no significant differences between patients and healthy controls in their tendency to display a personalizing bias (Achim, Sutliff, Samson, Montreuil, & Lecomte, 2016). To date, there have been no investigations comparing attributional styles of early psychosis patients to those with established psychosis, nor have there been longitudinal examinations of attributional styles in early psychosis to determine whether these phenomena are state-like or enduring over time (Healey et al., 2016).

1.5.5 Summary of Performance across Domains

Overall, it has been well-established that individuals in the early stages of psychosis perform reliably below healthy controls across domains of social cognition, specifically emotion perception, social perception and knowledge, and ToM (Healey et al., 2016). In addition, comparable levels of social cognitive impairment have been reported among patients in the early and later stages of a psychotic illness on domains of social perception and knowledge and ToM, but results have been mixed for the domain of emotion perception (Healey et al., 2016). Although these findings imply that social cognitive

deficits are not explained by the effects of illness progression, chronicity of psychosis, or long-term pharmacotherapy (Bora & Pantelis, 2013), it should be noted that most of the aforementioned research is based on cross-sectional data. Among the few studies that have examined social cognitive performance longitudinally in early psychosis, the results have been consistent and indicate that impairments in emotion perception, social perception and knowledge, and ToM are stable over the short-term, even after accounting for psychotic symptomatology.

Not all domains of social cognition have received equal attention. A review of the literature revealed that emotional processing and ToM in early psychosis have been more thoroughly studied than social perception and knowledge and attributional styles (Healey et al., 2016), and one explanation is that impairments are most pronounced for the former domains (Thompson et al., 2012). Nevertheless, further research on attributional styles is particularly warranted. The equivocal findings preclude any conclusive statements about whether early psychosis patients display differences in attributional styles relative to healthy controls or chronic patients, and if this social cognitive domain shows temporal stability.

1.6 Onset and Course of Social Cognitive Impairments in Psychosis

1.6.1 Theoretical Explanations for the Onset of Impairments

Although it is now widely accepted that impairments exist across domains of social cognition and phases of illness, earlier theories proposed that impaired ToM was related to clinical status in psychosis (for a full review, see Brüne, 2005). Frith (1992) postulated that an underlying misrepresentation of one's own and others' mental states was responsible for psychotic symptoms, and that varying degrees of ToM impairment gave rise to diverse clinical presentations. According to Frith (1992), unlike individuals with autism, ToM abilities develop normally in those with psychotic disorders, but deteriorate after the onset of illness, and the degree of deterioration is associated with distinct symptom clusters. These clusters are described in order of decreasing severity: (1) *prominent behavioural signs*, such as negative symptoms (e.g., asocial behaviour or flat affect) and disorganized symptoms (e.g., incoherent or inappropriate speech), which reflects a lack of awareness for one's own intentions; (2) *paranoid symptoms* (e.g.,

delusions of reference and persecution), which reflect a reduced ability for monitoring the thoughts and intentions of others; (3) *passivity symptoms* (e.g., delusions of thought control and insertion), which reflect a reduced ability for self-monitoring and limited awareness of self-generated thoughts; or (4) *remitted symptoms*, which reflect intact mentalizing abilities that are comparable to healthy controls (Harrington, Siegert, & McClure, 2005).

Given the heterogeneous nature of psychosis, one of the advantages of Frith's (1992) model is its ability to provide hypotheses about ToM based on the specific symptom presentation of individuals. Although this model has received empirical support (e.g., Corcoran, Mercer, & Frith, 1995; Pickup & Frith, 2001), a major limitation is the lack of a clear explanation for ToM performance when patients have co-occurring symptom clusters, given this issue was not addressed in Frith's (1992) original model. An alternative theory put forward by Abu-Akel and Bailey (2000) proposed that ToM abilities in psychotic disorders occur along a continuum of severity but, unlike Frith's (1992) model, do not predict symptom subgroups. Rather, Abu-Akel and Bailey's (2000) continuum emphasizes that poor performance on measures of ToM does not necessarily reflect an absence of ToM and that individuals with psychosis can experience a range of ToM abilities. These abilities vary from a genuinely impaired ToM (i.e., no representation of mental states) to normal ToM with a deficit in applying this awareness, to an overattribution of mental states (or "hyper" ToM) in which individuals overgenerate hypotheses and overmentalize, which can lead to erroneous predictions and misattributions of the intentions of others (Abu-Akel & Bailey, 2000).

1.6.2 Course of Impairments

Earlier conceptualizations of ToM impairment (e.g., Frith, 1992) hypothesized that ToM impairment in psychosis was state-dependent, such that ToM abilities were compromised during periods of acute illness and normalized during periods of symptom remission. In contrast, a trait-dependent hypothesis posits that ToM abnormalities are evident before, during, and after active symptoms, and

remain stable over time, regardless of clinical status, which suggests they represent a possible trait marker for psychotic illness (Sprong, Schothorst, Vos, Hox, & van Engeland, 2007).

For a characteristic to be considered a trait marker for an illness, it must not only be present in patients who are chronically ill, but also detectable in early manifestations of the illness and individuals known to be at risk of developing the illness (Thompson, Bartholomeusz, & Yung, 2011). Indeed, small to moderate impairments across all domains of social cognition are already apparent in individuals at clinical high risk for psychosis, with the largest impairments identified in attributional styles or biases (Lee, Hong, Shin, & Kwon, 2015). In one study by Kim et al. (2011), social cognition was even shown to be an independent predictor of conversion to a full-threshold psychotic disorder.

Social cognitive abilities have also been assessed in other high-risk samples, such as those at familial risk. A meta-analysis reported that unaffected first-degree relatives of individuals with psychosis displayed consistently lower performance on measures of emotion processing ($d = 0.41$), social perception and knowledge ($d = 0.42$), and ToM ($d = 0.48$) compared to healthy controls (Lavoie, Lacroix, Godmaire-Duhaime, Jackson, & Achim, 2013). Moreover, first-degree relatives ($d = 0.37$) and individuals at clinical high risk ($d = 0.45$) perform intermediate to healthy controls and those in the chronic stages of psychosis ($d = 1.1$) on measures of ToM (Bora & Pantelis, 2013; Bora et al., 2009), suggesting that ToM impairment fits with the sequence of illness severity. Nevertheless, impairment may plateau by the early stages of illness since the magnitude of ToM difficulties by the first episode of psychosis ($d = 1.0$) is comparable to that of chronic patients (Bora & Pantelis, 2013).

1.7 Correlates of Social Cognition in Early Psychosis

The impairments observed across domains of social cognition have prompted investigations into the clinical correlates of social cognitive performance in the early stages of psychosis.

1.7.1 Psychotic Symptoms

Trends in the literature indicate that negative symptoms are related to social cognitive abilities to a greater extent than positive symptoms (Healey et al., 2016). For instance, significant correlations have

been detected between negative symptoms and multiple measures of social cognition (e.g., emotion perception, social perception and knowledge, and/or ToM; Piskulic & Addington, 2011; Vohs et al., 2014); however, these results are not uniform across all studies. Some research suggests that no associations exist between positive or negative symptoms and social cognition in patients with early psychosis (Bertrand et al., 2007), whereas there is also evidence that supports the relationship between both symptom domains and social cognitive performance (Ventura et al., 2015). Other research has proposed that individual negative symptom domains, such as stereotyped thinking, may be a more useful approach in predicting performance on social cognition in early psychosis than global symptom measures (Piskulic & Addington, 2011). These inconsistent findings bring into question the degree to which psychotic symptoms and social cognition are linked in the early stages of illness.

1.7.2 Neurocognition and Functioning

Unlike positive and negative symptoms, which tend to fluctuate across illness phases, marked impairments in neurocognition and social cognition appear in the early course of illness and persist over time. However, the extent to which social cognition is truly independent of neurocognition remains a controversial issue in the psychosis literature (Stanghellini & Ballerini, 2011). Exploratory (van Hooren et al., 2008) and confirmatory (Sergi et al., 2007) factor analyses have demonstrated that neurocognition and social cognition are highly correlated but distinct constructs in psychotic disorders, and that a two-factor model fits the data better than one unitary construct. There is also evidence that differential neural pathways are implicated in the processing of social and non-social stimuli, which suggests these constructs are non-overlapping (Pinkham, Penn, Perkins, & Lieberman, 2003). Traditionally, neurocognition has been conceptualized as a prerequisite to social cognition because processing socially-relevant stimuli relies on intact neurocognitive processes, such attention and working memory (Yong et al., 2014). Indeed, Fanning, Bell, and Fiszdon (2012) identified a low frequency of schizophrenia patients who had impaired neurocognition but intact social cognition (<1%), whereas it was much more common for patients to exhibit impaired social cognitive performance in the presence of intact neurocognitive

abilities (25%). Moreover, Vauth, Rüsç, Wirtz, and Corrigan (2004) reported that neurocognition accounted for over 80% of the variance in social cognitive performance in schizophrenia patients, suggesting that tasks assessing social cognition can tax neurocognitive processes to varying degrees.

Despite findings that support neurocognition and social cognition as separable constructs, an important research question has been whether social cognition can provide uniquely relevant information for understanding functioning beyond that of neurocognition. As previously reported, neurocognitive impairments have been found to maintain functional disability for first episode (Santesteban-Echarrie et al., 2017) and chronic (Green et al., 2004) samples. In recent years, researchers have come to appreciate the functional relevance of social cognition in psychotic disorders. Significant relationships have been reported between most domains of social cognition (e.g., emotion perception, social perception, and ToM) and community functioning, with correlations ranging from 0.30 to 0.50 (Fett et al., 2011). In a sample of first- and multi-episode psychosis patients, social cognition fully mediated the relationship between neurocognition and functioning (Addington, Girard, Christensen, & Addington, 2010). According to meta-analytic research, not only is social cognition critical in predicting functional outcomes, but it explains variance in community functioning beyond that of global neurocognition (16% vs. 6%, respectively; Fett et al., 2011). Prospective studies, although limited in early psychosis, have provided longitudinal support for this relationship. For instance, Horan et al. (2011) found that higher performance on social cognition at baseline and one-year follow-up both strongly predicted better outcomes in domains of independent living, social functioning, and school or work performance for first episode patients. Stouten, Veling, Laan, van der Helm, and van der Gaag (2014) also reported that ToM was the only clinical predictor of social functioning over a one-year period.

Collectively, these findings indicate the early stages of psychosis are characterized by persistent impairment in social cognition, which has emerged as a major determinant of everyday functioning, above and beyond the contribution of neurocognition. Furthermore, although neurocognition and, to a lesser extent, psychotic symptoms are related to social cognition, social cognition is an independent construct that appears to be the most proximal predictor of functional outcome in psychosis, both cross-

sectionally and longitudinally, and, therefore, represents an important target for psychosocial treatment and functional recovery (Harvey & Penn, 2010).

1.8 Conceptual and Methodological Issues in the Study of Social Cognition

Based on the research conducted to date, it is clear that studying social cognition provides added value to our understanding of functional outcomes in psychotic disorders (Horan, Lee, & Green, 2013). However, the rapid expansion of research in this area has resulted in the use of increasingly diverse approaches to define and assess social cognition, which has led to mounting issues with the findings that have been reported. First, measures of social cognition in psychosis are heterogeneous and often have unknown or unsatisfactory psychometric properties, which can compromise the validity and reproducibility of research findings (Pinkham, Penn, Green, & Harvey, 2015). Green et al. (2008) have suggested that applying social cognitive measures that were originally developed for non-psychotic populations is problematic for interpreting the meaning of scores due to scaling issues (e.g., ceiling effects) and inconsistent scoring across studies.

Second, despite evidence that emphasizes the multidimensionality of social cognition (Couture et al., 2006), there is conceptual overlap in the domains and measures selected to assess each construct, which can conflate research findings and pose a challenge for determining the specificity of impairments. One study by Mancuso, Horan, Kern, and Green (2011) sought to clarify the factor structure of social cognition using an assessment battery that spanned the four putative domains of social cognition in 85 outpatients with psychosis. The authors found social cognition comprised three factors: (1) attributional style; (2) “lower level” processing (e.g., emotion perception and detecting lies), and (3) “higher level” processing (e.g., managing emotions and detecting sarcasm), which was at odds with the prevailing framework of social cognition proposed by Green et al. (2008). To address issues with the definition and measurement of social cognition, efforts have been undertaken to establish a consensus definition of social cognition in psychotic disorders (Green et al., 2008), and develop a battery of social cognitive measures with strong psychometric properties (Pinkham et al., 2013; Pinkham et al., 2015) to help guide

the selection of suitable measures for each domain and facilitate the comparability of findings across research studies.

Even with a more streamlined and empirically-grounded approach to define and assess social cognition, many of the traditional measures that are still predominantly featured in the literature lack ecological validity. These measures often consist of static pictures (e.g., Reading the Mind in the Eyes Test; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) or social vignettes (e.g., the Hinting Task; Corcoran et al., 1995) that are presented in only one sensory modality and do not offer insight into the specific nature and complexity of impairment in social cognition (Abu-Akel & Shamay-Tsoory, 2013). Moreover, the assessments that rely on verbal or written social vignettes, often in paper-and-pencil format, do not properly capture the dynamic characteristics inherent in social interactions, nor do they closely resemble the interpersonal situations or contexts that are relevant to individuals with severe mental illness. These measures also place high cognitive demands on reading, comprehension, and/or working memory (Kern & Horan, 2010), which may already be compromised in patients, and make it difficult to ascertain whether social cognitive performance is secondary to primary difficulties with neurocognition or related abilities. To overcome the limitations of existing measures, it has been suggested that video-based stimuli are a preferred method of assessing social cognition, and provide better detection of impairment in patients with psychosis compared to traditional measures (Bazin et al., 2009). Additionally, video-based stimuli: (a) involve complex visual and auditory contextual cues that rely on the simultaneous use of multiple modalities and social cognitive abilities (e.g., emotion perception, social perception and knowledge, and ToM), and (b) capture subtler and dynamic features of communication that closely resemble real-world social interactions compared to traditional measures of social cognition.

Finally, and arguably most problematic, results from the aforementioned studies do not provide clear evidence about the directionality of the relationships between social cognition and other important illness-related factors since most of the analyzed data are cross-sectional (Fett et al., 2011). For instance, although social cognition has been strongly related to deficits in neurocognition (Sergi et al., 2007; van

Hooren et al., 2008) and motivation (Gard et al., 2009), the nature of these relationships is unclear since no experimental manipulations have been applied to confirm whether or not causal, linear relationships exist (Stanghellini & Ballerini, 2011). Moreover, given that tasks of social cognition can place demands on neurocognitive and motivational resources, performance on these tasks is likely being affected by other factors that are impaired in psychosis, yet are not being assessed or accounted for in existing measures.

1.9 Goals of the Proposed Research

Given the methodological concerns reviewed above, the aims of the proposed research are to build on the existing literature base to better understand the illness-related factors that underlie and contribute to social cognitive performance in the early stages of psychosis. Previous research has failed to account for the features of social cognitive measures that might be directly influencing performance and contributing to difficulties. Therefore, an important next step is to determine whether measurement issues preclude an accurate assessment and interpretation of social cognitive abilities.

In the current projects, video-based measures of ToM were experimentally manipulated to examine the extent to which performance on them was directly influenced by factors other than pure social cognitive abilities in early psychosis. Participants recruited for these projects were individuals enrolled in a specialized clinical service for early psychosis, and a comparison group of community controls with a similar age and gender distribution. Two specific illness-related factors that have been previously shown to be associated with social cognitive performance were examined, and a comprehensive battery was developed and administered to assess for both factors in the same sample of participants. Chapter 2 presents data on the relationship between jumping to conclusions and social cognition in early psychosis, and the degree to which this cognitive bias, most commonly observed in psychotic disorders, was implicated in social cognitive abilities. Chapter 3 presents data on the relationship between motivation and social cognition, and whether performance of patients with early psychosis were enhanced by manipulating task motivation. Chapter 4 provides a general discussion about

the clinical and research implications of social cognition and its relevance to psychosocial treatment and functional recovery in early psychosis.

Chapter 2

Jumping to Social Conclusions in Early Episode Psychosis

2.1 Introduction

Functional disability is an impediment to recovery for individuals with schizophrenia spectrum disorders, in part due to early and sustained impairments in social cognition. Social cognition is a multifaceted construct that encompasses four distinct yet complementary domains: emotion perception, social perception and knowledge, theory of mind (ToM), and attributional styles or biases (Green et al., 2008). Marked difficulties across domains of social cognition are evident prior to the onset of psychotic symptoms and remain stable over the course of illness, even after improvements in clinical status (Green et al., 2011). Given the longitudinal stability of these impairments and their relevance to functional outcomes (Horan et al., 2011), social cognition has become increasingly regarded a critical treatment target for patients, and has important implications for the development, course, and outcome of illness (Couture et al., 2006).

It is now widely accepted that social cognitive abilities mediate the relationship between neurocognition and functioning (Schmidt et al., 2011), and provide an independent and more robust estimate of real-world outcomes than neurocognition alone (Fett et al. 2011; Sergi et al., 2007; van Hooren et al., 2008). However, aside from neurocognition, the illness-related factors that underlie and contribute to performance on measures of social cognition remain largely unexplored. Therefore, identifying the predictors of social cognitive performance is warranted to better understand social dysfunction in psychosis and to promote the development of more targeted clinical interventions for patients.

Unlike impairments in neurocognition, which refer to broad-based thinking abilities, cognitive biases refer to distorted thinking styles and are illness-related factors that may be implicated in social cognitive abilities. Cognitive biases are pervasive and transdiagnostic features of psychiatric disorders

that influence decision-making and maintain functional disability. Although a range of cognitive biases exist, individuals with psychosis, particularly those with delusions (Garety & Freeman, 2013), display a tendency to gather limited information before arriving at a decision. Commonly referred to as jumping to conclusions (JTC), this cognitive bias is one of the most comprehensively studied in psychosis due to its central role in the formation and maintenance of delusions (Peters et al., 2013). A JTC response can even be detected in non-clinical populations with higher levels of paranoid delusional thoughts (Freeman, Pugh, & Garety, 2008). Accordingly, it has been suggested that reductions in data gathering increase the probability of erroneous conclusions and acceptance of incorrect ideas (Garety et al., 2013), which may be a precursor to delusions.

In addition to the JTC bias, patients with psychosis exhibit a bias against disconfirmatory evidence (BADE), which is a reduced ability to update faulty interpretations as new information becomes available, especially when that information is incongruent with previously accepted beliefs (Moritz & Woodward, 2006). BADE, also regarded as the belief inflexibility bias, reduces the reappraisal of information, maintains fixed and erroneous beliefs, and has been documented across various phases of psychotic illness (Eisenacher & Zink, 2017). Taken together, these biases collectively suggest that patients with psychosis are more likely than non-psychiatric controls to engage in hasty decision-making and fail to consider and integrate alternative explanations of events, which contributes to the persistence of inaccurate and delusional beliefs. Although much of the evidence for JTC and BADE is based on data from patients with active psychotic symptoms, these biases have been documented during periods of remission, suggesting they are stable response patterns (Peters & Garety, 2006) that may represent a trait marker for psychotic illness (Dudley, Taylor, Wickham, & Hutton, 2015).

A classic experimental paradigm used to measure JTC is a probabilistic reasoning task, often referred to as the “Beads Task.” In the task, individuals are presented with two jars of coloured beads that have equal but opposite ratios (e.g., 60 red and 40 blue beads, and vice versa). Both jars are then hidden from view, and individuals are told that beads will be consecutively drawn from one of the jars and they must determine the jar from which the beads are being drawn. JTC has been operationally defined by the

number of beads drawn before a decision is made (i.e., ‘draws to decision’) and how quickly individuals rate themselves to be certain about their decision (Falcone et al., 2014). A meta-analysis found that patients with psychosis were four to six times more likely to arrive at a premature response on the Beads Task (i.e., draws to decision of ≤ 2 beads) relative to healthy controls and those with non-psychotic mental health problems, highlighting the specificity of this bias to psychotic illness (Dudley et al., 2015).

A majority of empirical studies examining JTC have used the Beads Task or a close variation that is less abstract, more personally relevant, and/or emotionally salient (Dudley et al., 2015). To strengthen the account that the JTC response pattern is not bound to specific features of the Beads Task, Moritz, Woodward, and Hausmann (2005) implemented a novel task to obtain convergent evidence. In their study, schizophrenia patients and healthy controls were provided with 20 knowledge questions and four response options for each question. Both groups were asked to provide probability estimates (ranging from 0-100%) for the different response options and a decision regarding each option (i.e., a rejection or decision). No between-group differences emerged in probability estimates for the response options, yet patients endorsed significantly more erroneous responses and made decisions when their own probability estimates were significantly lower (54.4%) relative to healthy controls (70%; Moritz et al., 2005). These results lend further support to the claim that individuals with psychosis have a tendency to make strong judgments based on limited information, and that JTC extends to contexts other than probabilistic reasoning tasks.

While a large body of research using a variety of tasks has established that patients with psychosis consistently display a JTC response, many of the tasks used to assess this bias lack ecological validity and do not necessarily generalize to real-world situations. For instance, probabilistic reasoning tasks often involve non-social stimuli and fail to provide clear evidence that JTC has social consequences. Given that paranoid delusions are believed to arise from a misunderstanding of the perspectives of others (Woodward, Mizrahi, Menon, & Christensen, 2009), it would seem reasonable to conclude that JTC contributes to inaccurate social perceptions and judgments in psychosis, yet no experimental research has tested this hypothesis.

There is preliminary support that a relationship exists between JTC and social cognition; however, the nature of this relationship is still not well understood. Some research suggests that both constructs load onto separate factors and have unique underlying processes (Woodward et al., 2009), whereas other studies report that a JTC response is significantly associated with impaired ToM performance (e.g., Langdon, Ward, & Coltheart, 2010; Rubio et al., 2011). This relationship remains inconclusive in part because no experimental research has examined the directionality between JTC and social cognition to clarify whether JTC is, in fact, implicated in social cognitive abilities.

Therefore, the primary goal of the present study was to test the hypothesis that JTC plays an important role in the insufficient and inaccurate processing of social stimuli for individuals in the early stages of psychosis compared to community controls. To achieve this goal, a more ecologically valid assessment of JTC using naturalistic, social stimuli was developed by experimentally manipulating an existing measure of social perception and knowledge. In a modified version of the Interpersonal Perception Task (IPT-15; Costanzo & Archer, 1989), video clips of interpersonal scenarios were paused at three distinct time points linked to transitions in the scenes (see Methods below), which allowed for the gradual exposure of social stimuli over the course of the scenarios. The expressive behaviours of individuals in the video clips provide relevant information to draw inferences about the scenarios and to answer questions related to the characters, the veracity of their statements, and nature of their relationships. At all three time points, respondents were asked to identify: (a) the multiple-choice answer they believe to be correct about the scenario that was presented; (b) how confident they are in their response; and (c) how much additional social information they require to answer the question.

A series of hypotheses related to JTC and BADE were established in the present study. On the modified IPT-15, it was expected that above average confidence and below average need for additional social information at the beginning time points of the interpersonal scenarios would be indicative of a JTC response, and would be more frequently observed in patients relative to controls. A BADE response was defined as the reduced flexibility of social judgments, which was expected to manifest as non-significant differences in the accuracy, confidence, and amount of additional social information needed across the

three time points for the patient cohort. More specifically, it was first anticipated that patients with psychosis would exhibit significantly lower accuracy across all time points of the modified IPT-15 relative to community controls. An interaction effect was also predicted, with the slope of improvement for accuracy hypothesized to be greater for controls than patients. Unlike patients who tend to exhibit a BADE, controls were expected to integrate novel, and perhaps contradictory, social information across the three time points of the scenarios to improve their response accuracy. Second, it was anticipated that patients with psychosis would exhibit significantly higher confidence, especially during the beginning time point, relative to community controls. Given the tendency of patients to rapidly appraise information and remain overconfident in their initial judgments, an interaction effect was also predicted, such that patients would maintain a high level of confidence across all time points, whereas controls would progressively increase their confidence with greater exposure to social stimuli. Third, patients with psychosis were expected to request significantly less social information across the three time points than community controls. Another interaction effect was also anticipated, as patients were expected to maintain their low need for additional social information over time, whereas controls were expected to steadily reduce their need for additional social information as more relevant cues were revealed.

Secondary aims of this study were to examine the relationship between JTC and social perception and knowledge in the early stages of psychosis, given that much of the aforementioned research has been limited to patients with chronic illness and only examined with measures of ToM. Moreover, because there is insufficient data on the clinical correlates of JTC in early psychosis samples (e.g., Falcone et al., 2014; González et al., 2018), no hypotheses were formulated as these analyses were considered exploratory.

2.2 Method

2.2.1 Participants

Seventy participants (35 early psychosis outpatients; 35 community controls) were retained in the final analyses for the present study. A total of 43 outpatients receiving treatment at an early intervention

program in Kingston, Ontario were initially recruited for participation. All individuals enrolled in this specialized clinical service who were in the early stages of their illness, defined by an illness duration of less than five years, were eligible for study inclusion. The final diagnostic disposition of patients was determined during consensus clinical rounds meetings using DSM-IV criteria (American Psychiatric Association, 2010). Individuals were removed from analyses on the basis of having a non-psychotic primary diagnosis ($n = 1$) or substance-induced psychosis ($n = 7$). Additional exclusion criteria were defined prior to the study and included a history of head injury or neurological condition, or non-fluent in English as determined by referring case managers. The final sample of early psychosis participants ($N = 35$) ranged in age from 16 to 37 years and were mostly comprised of males. All patients had a non-affective or affective psychotic disorder, and were diagnosed with the following conditions: schizophrenia ($n = 14$; 40%), bipolar disorder with psychotic features ($n = 8$; 22.9%), schizoaffective disorder ($n = 3$; 8.6%), schizophreniform ($n = 3$; 8.6%), psychosis not otherwise specified ($n = 3$; 8.6%), delusional disorder ($n = 2$; 5.7%), and major depressive disorder with psychotic features ($n = 2$; 5.7%).

Thirty-six community controls were recruited through advertisements posted in the community and online, and were age- and gender-matched to the outpatient cohort. One participant was removed from all analyses due to an extreme response style as described in the Data Analysis section, resulting in a final sample of 35 community controls. The majority of these participants were male, and ranged in age from 18 to 34 years old. In addition to the above exclusion criteria, community controls were screened for past or current psychiatric disorders prior to study enrollment. All community controls denied having any psychiatric diagnoses, and were not taking any medications at the time of testing.

2.2.2 Measures

2.2.2.1 Demographics

A structured form was used to gather demographic information from both self-report and medical health records. Psychiatric diagnoses and medication data were collected for the patient cohort.

2.2.2.2 Psychiatric history

The Structured Clinical Interview for DSM-IV, Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 2002) is a highly reliable and valid clinical interview instrument that is widely recognized as the gold standard for assessing psychiatric disorders for clinical research purposes. Given the full interview takes several hours to administer, relevant modules of the SCID-I were used to assess past or current symptoms of Axis I Disorders in community controls, including the mood, psychosis, and substance use and dependence modules.

2.2.2.3 Psychiatric symptoms

The Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962) is a semi-structured interview of psychopathology, with ratings based on symptoms over the past two weeks and behavioural observations made during the interview. The BPRS assesses the presence and severity of 18 psychiatric symptom domains, such as anxiety, depressed mood, suspiciousness, and grandiosity on a 7-point Likert scale, ranging from “Not Present” to “Extremely Severe.” Item ratings were aggregated to compute a total psychopathology score, and four symptom dimensions (manic-excitement, negative, positive symptoms, depression-anxiety) were based on mean scores from a factor analysis on the BPRS conducted in an early psychosis sample (Ventura, Nuechterlein, Subotnik, Gutkind, & Gilbert, 2000).

2.2.2.4 Estimated premorbid intelligence

The Wide Range Achievement Test—Reading Recognition Subtest (WRAT-3; Wilkinson, 1993) requires examinees to read a list of words of increasing complexity, and provides an estimate of premorbid intelligence based on age-matched normative data.

2.2.2.5 Neurocognition

The Screen for Cognitive Impairment in Psychiatry (SCIP; Purdon, 2005) is a paper-and-pencil assessment designed to provide a brief examination of neurocognitive abilities that are commonly impaired in psychiatric disorders. Total administration time is under 20 minutes. The five subtests of the SCIP include: immediate and delayed verbal learning, working memory, verbal fluency, and processing

speed. A global neurocognition score is derived by averaging performance across these five subtests. Raw scores were converted to standard scores based on normative data from a validation study of 185 university-aged participants (Purdon, 2005).

2.2.2.6 Social cognition

The Interpersonal Perception Task (IPT-15; Costanzo & Archer, 1989) is a measure of social perception and knowledge designed to assess accuracy in interpreting the expressive behaviour of others. Stimuli for the IPT-15 includes video clips of 15 naturalistic social scenarios, ranging in length from approximately 30 seconds to 2 minutes, that were edited down from longer, unscripted interactions. One to four individuals with diverse age and ethnic groups are featured in the scenarios, and a variety of verbal and non-verbal cues are available to answer questions related to five themes of the social interactions: kinship, intimacy, deception, competition, and social status. All five themes are assessed in three different scenarios. Prior to each scenario, a multiple-choice question is presented with two or three response options for respondents to consider as they view each video clip. The primary outcome measure is the total number of correct responses, and a maximum score of 15 indicates an accurate interpretation of all scenarios.

The IPT-15 was originally developed to assess interpersonal sensitivity, which is a construct that closely aligns with social intelligence (i.e., the understanding of social rules and conventions as well as interpersonal skills; Austin & Saklofske, 2005). Within the psychosis literature, interpersonal sensitivity shares conceptual overlap with social perception and knowledge, which has been defined as knowing social rules, roles, and goals to decode and interpret social cues in others (Pinkham et al., 2013). The IPT-15 has been shown to be a reliable and valid measure in non-clinical populations, with a retest reliability coefficient of .73, and higher scores being significantly related to higher peer ratings of social skills (Costanzo & Archer, 1989). Although its use in clinical samples is limited, a study by Vaskinn, Sergi, and Green (2009) found that outpatients with schizophrenia spectrum conditions ($n = 72$; $M = 8.7$, $SD = 1.7$) performed significantly worse on the IPT-15 than healthy controls ($n = 58$; $M = 10.2$, $SD = 1.7$).

2.2.2.7 Jumping to conclusions

Two computerized versions of the Beads Task with easy (85:15) and difficult (60:40) task ratios were used to assess JTC (Garety et al., 2005). In both versions, two jars containing two colours of beads with equal but opposite ratios are shown to respondents, who are informed that one of the jars will be randomly selected and that beads will be consecutively drawn from that jar. Each time a bead is drawn, respondents can either request to view another bead from the jar, or indicate they are certain they know from which jar the beads are being drawn, which ultimately ends the task. In the easy version of the task, respondents are presented with an image of two jars with very distinct ratios of coloured beads (e.g., one jar with 85 orange beads and 15 black beads; one jar with 85 black beads and 15 orange beads), whereas in the difficult version, the two jars have ratios of coloured beads that are closer together and harder to distinguish (e.g., one jar with 60 red beads and 40 blue beads; one jar with 60 blue beads and 40 red beads). The primary outcome measure from both tasks is the number of beads requested by respondents before making a decision (draws to decision), and JTC is defined as two or fewer draws to decisions.

2.2.2.8 Global functioning

The Sheehan Disability Scale (SDS; Sheehan, Harnett-Sheehan, & Raj, 1996) is a 3-item self-report rating of global functioning in three discrete domains: work/school, social life or leisure activities, and family life or home responsibilities. The SDS is rated on an 11-point Likert scale from “Not at All” to “Extremely,” and captures the extent to which clinical symptoms have caused disruptions in functioning across these domains during the past week. Total scores are calculated by summing the three domain scores, and range from 0 to 30. Respondents have the option of skipping over the work/school domain if they have not worked/studied during the past week for reasons unrelated to clinical symptoms. However, early psychosis patients who skipped over the work/school domain, but also disclosed they were recipients of social assistance during the demographics interview ($n = 6$), provided a conflicting account of their functional impairment. Although total SDS scores (ranging from 0-30) are typically calculated by summing the three domain scores, mean SDS scores (ranging from 0 to 10) were instead calculated by

obtaining an average of the domain scores for only those domains that were rated. This alternative method of scoring was used due to the lack of consistency in patient responses on the work/school domain, and has been used by previous investigators (see Weiller et al., 2018 for a summary).

2.2.3 Procedure

The research protocol was approved by the university ethics review board, and written informed consent (or verbal assent for participants younger than 18 years old) was obtained after study procedures were fully explained. Assessments were conducted by Doctoral-level students or Bachelor-level research assistants who were blinded to the study hypotheses, although telephone screeners and symptom interviews were only administered by Doctoral-level students trained on the SCID-I and BPRS. Diagnoses for patients were extracted from medical health records at the time of testing, and were based on semi-structured clinical interviews conducted by psychiatrists with expertise in early psychosis. Given the inconsistency in clinical presentation during the early stages of psychosis (Salvatore et al., 2009), medical health records were reexamined for any patients initially diagnosed with a substance-induced psychotic disorder at approximately one year following their participation in the present study to confirm their diagnostic status.

A modified version of the IPT-15 was developed for the present study. All of the original stimuli were retained in this modified version; however, adjustments were made to the structure and administration of the task. For the purposes of assessing JTC and BADE, it was necessary for all of the interpersonal scenarios to have verbal and non-verbal cues that were gradually revealed so that social judgments could develop over time and be well-formed by the end of every video clip. Ten of the video clips and multiple-choice questions from the IPT-15 naturally conformed to this format. However, the five remaining video clips involved two distinct but related scenarios and multiple-choice questions that asked respondents to make comparisons between the two scenarios. Because these two-part clips were not fully independent of one another, they were divided into two stand-alone items, each with updated multiple-choice questions, which resulted in a total of 20 unique video clips for the modified version. For

instance, one item on the original task asked respondents to determine “*Who are the women talking to?*” after presenting two consecutive video clips, each with a different woman speaking to an individual off screen. The following response options were provided: A) Both women are talking to strangers; B) Both women are talking to friends; or C) The first woman is talking to a friend, the second woman is talking to a stranger. In the modified version of the task, these related video clips were separated into two items that each asked, “*Who is the woman talking to?*” with the updated response options being: A) A stranger; or B) A friend. The order of items was left as close to the original task as possible; however, the five video clips that were divided into ten stand-alone items had some overlap in terms of characters and social content. Therefore, these ten items were interspersed throughout the task with exactly five other video clips placed in-between each set of related clips to reduce the likelihood that social cues and judgments from one scenario would influence the other scenario.

All of the 20 video clips were subsequently divided into three distinct time points: beginning, middle, and end. At the beginning of every scenario, limited social cues were available which did not allow for the generation of accurate social judgments. However, as additional social cues and contextual information were revealed over the course of the scenario, informed social judgments were possible, especially by the middle and end points of the scenario. A consensus meeting was held with five researchers with expertise in psychosis and social cognition to review the 20 video clips and determine the time points that constituted the beginning and middle. During this meeting, all of the video clips were presented in their entirety, one at a time, in the order in which they appeared on the task. The researchers were asked to record the specific verbal and/or non-verbal cues that they believed corresponded with the beginning and middle of every scenario, as defined by the following criteria: The beginning was defined as the time point during which one or fewer meaningful verbal or non-verbal social cues were revealed, which could not allow for an accurate response that was informed by social stimuli. The middle time point was selected on the basis that more than one meaningful verbal or non-verbal social cue had been revealed, which allowed for a more accurate and informed social response. Finally, the end time point was uniformly set at the conclusion of every scenario when all of the verbal and non-verbal social cues

had been revealed and the highest level of response accuracy was possible. Video clips were replayed as often as needed. After the researchers independently recorded their responses, they were collectively evaluated as a group. A unanimous agreement regarding the social cues and time points that coincided with beginning and middle of each scenario was achieved before advancing to the next video clip.

Similar to the original administration of the IPT-15, a multiple-choice question was presented before each video clip that asked respondents to reach a conclusion about one of five potential aspects of the scenario: kinship, intimacy, deception, competition, or social status. However, in our modification of the IPT-15, respondents were also asked to provide judgments and confidence estimates based on their responses, which was based on a related methodology by Moritz et al. (2005).

To assess for JTC and BADE in a social context, the 20 video clips of interpersonal scenarios were paused at three time points, and respondents were asked to answer a set of three questions every time: (1) Indicate the response they believed to be correct (A, B, or C if applicable); (2) Rate the confidence in their response (ranging from 0 “completely unconfident/uncertain” to 100 “completely confident/certain”); and (3) Rate how much additional social information they required (ranging from 0 “none” to 4 “a great deal”). Even if respondents reported needing very little or no additional information during the beginning or middle time points, they were still shown the remainder of the video clip to reduce the effects of impulsivity or low motivation and maintain consistency across the task. A response form included three sets of questions that corresponded with the three time points on every scenario, and this form was placed in front of respondents so they could refer to their earlier responses throughout the duration of the scenario to reduce working memory demands (see Figure 2.1 for a sample response form).

The set of three questions allowed for the assessment of premature and uninformed social judgments (i.e., JTC) and whether these judgments were maintained even after exposure to novel and potentially disconfirmatory social stimuli (i.e., BADE) on the modified IPT-15. A JTC response pattern was operationalized as endorsing an average confidence rating above chance (>50%) while also requesting a below average amount of additional social information (<2.5) on the beginning time point across the 20 items. A BADE response pattern was defined as the reduced flexibility of social judgments,

as assessed by the presence of non-significant differences in the average accuracy, confidence, and amount of additional social information needed across the three time points on the 20 items.

The modified IPT-15 was completed following the administration of the demographics form and self-report measures. All participants were debriefed at the end of the study and remunerated \$15 for their participation.

2.2.4 Data Analysis

Data were inspected for normality and outliers prior to any statistical analyses. One community control was identified as an extreme outlier and removed from the study prior to any analyses due to confidence ratings that were more than 3 *SDs* below the mean across the three time points on the modified IPT-15. Among the sample of 70 participants, four had incomplete data on the modified IPT-15 due to early discontinuation of the study (1 early psychosis patient) or time limitations during testing that precluded a full administration of the task (2 early psychosis patients; 1 community control). Between-group comparisons of study participants on demographic and clinical characteristics were performed using Pearson chi-square tests for categorical variables and univariate ANOVAs for continuous variables. A Pearson chi-square test was used to compare participant groups on the proportion of individuals who exhibited a JTC response on the modified IPT-15. To assess for BADE responses, mixed-model repeated measures ANOVAs were conducted to examine the between-subject effect of group (early psychosis vs. community controls) and within-subject effect of time point (beginning, middle, and end) on accuracy (i.e., total number of correct responses), confidence, and additional information needed across the 20 items of the modified IPT-15. Significant main effects and interactions were followed up with independent samples *t*-tests corrected for multiple comparisons ($.05/3 = .02$). Effect sizes were represented with partial eta squared, and conventional definitions of small (.01), medium (.06), and large (.14) effects were used to interpret the findings (Cohen, 1988).

Exploratory analyses were conducted using Pearson bivariate correlations to evaluate associations between JTC, social cognition, and clinical characteristics for early psychosis patients. Given the multiple

neurocognitive and symptom domains that were assessed and included in the correlational analyses, the Holm-Bonferroni step-down method was applied to control for family-wise error. An alpha level of .05 was considered statistically significant for analyses unless otherwise stated.

2.3 Results

Demographic and clinical characteristics of study participants are presented in Table 2.1. Both groups were similar with respect to age, sex, and ethnicity, but differed on other demographic variables, such as independent living status, years of education, current and highest occupational ranking, and estimated premorbid intelligence. Among the clinical variables assessed, patients reported greater psychiatric symptom severity and a higher degree of impairment on global neurocognition and daily functioning compared to controls.

JTC was examined with the easy (85:15) and difficult (60:40) ratios of the Beads Task. In terms of the number of draws to decision, early psychosis patients ($M = 5.23$, $SD = 5.45$) and community controls ($M = 6.97$, $SD = 5.34$) requested a similar number of beads on the easy task, $F(1, 67) = 1.8$, $p = .19$, partial $\eta^2 = .03$. A different pattern emerged on the difficult task, such that patients ($M = 7.24$, $SD = 4.97$) requested significantly fewer beads than controls ($M = 10.09$, $SD = 4.05$), $F(1, 66) = 6.74$, $p = .01$, partial $\eta^2 = .09$. The number and percentage of participants who requested two or fewer beads was also calculated (see Table 2.1). From these analyses, it was evident that patients were more likely than controls to exhibit a JTC bias on both the easy and difficult tasks at trend levels; however, when examined collectively, significantly more patients ($n = 12$; 34.3%) jumped to conclusions on at least one of the two beads tasks than controls ($n = 4$; 11.8%), $\chi^2(1) = 4.91$, $p = .03$.

To assess for JTC on the modified IPT-15, participants were dichotomized on the basis of whether they endorsed an above average level of confidence and a below average need for additional information at the beginning time point across the 20 items (JTC) or did not meet this criteria (no JTC). Significantly more patients ($n = 14$; 43.8%) exhibited a JTC response pattern on the social cognitive task than controls ($n = 3$; 8.8%), $\chi^2(1) = 10.52$, $p = .001$. A post-hoc one-way ANOVA was conducted to

compare the mean accuracy scores of the total sample who met criteria for a JTC response pattern during the beginning time points ($n = 17$) with those who did not ($n = 49$). This analysis revealed that patients and controls who jumped to social conclusions ($M = 10.94$, $SD = 2.25$) had significantly lower accuracy at the final time points compared to patients and controls who did not exhibit this response pattern early on in the social scenarios ($M = 12.84$, $SD = 2.09$), $F(1, 64) = 10.02$, $p = .002$, partial $\eta^2 = .14$.

To assess for BADE on the modified IPT-15, three mixed-model repeated measures ANOVAs were conducted to examine the effects of group and time point on the accuracy, confidence, and additional information needed. Means of these three outcome variables as a function of group and time point are presented in Figures 2.2, 2.3, and 2.4, respectively.

In terms of accuracy, there was a main effect of group, $F(1, 64) = 6.52$, $p = .01$, partial $\eta^2 = .09$, such that patients ($M = 11.09$, $SD = 1.82$) exhibited significantly fewer correct responses on the task than controls ($M = 12.2$, $SD = 1.68$). A main effect of time point was also observed, $F(2, 63) = 20.1$, $p < .001$, partial $\eta^2 = .39$, and the interaction of group and time point was approaching significance, $F(2, 63) = 2.77$, $p = .07$, partial $\eta^2 = .08$. Post-hoc paired contrasts revealed a significant increase in accuracy for all participants from the beginning ($M = 10.41$, $SD = 2.44$) to middle time points ($M = 12.23$, $SD = 2.15$), $t(65) = 5.49$, $p < .001$, and the beginning to end time points ($M = 12.35$, $SD = 2.27$), $t(65) = 6.31$, $p < .001$. Similar accuracy was reported from the middle to end time points, $t(65) = .51$, $p = .61$.

In terms of confidence, a main effect of time point on confidence ratings was found, $F(2, 63) = 68.83$, $p < .001$, partial $\eta^2 = .69$. There was no main effect of group, $F(1, 64) = .7$, $p = .41$, partial $\eta^2 = .01$, and no significant interaction of group and time point on confidence ratings, $F(2, 63) = 2.11$, $p = .13$, partial $\eta^2 = .06$. Post-hoc paired contrasts revealed a significant increase in confidence ratings for all participants from the beginning ($M = 50.73$, $SD = 15.17$) to middle time points ($M = 60.07$, $SD = 13.74$), $t(65) = 10.84$, $p < .001$, the middle to end time points ($M = 68.27$, $SD = 13.63$), $t(65) = 9.87$, $p < .001$, and the beginning to end time points, $t(65) = 11.71$, $p < .001$.

In terms of additional information needed, there was a significant main effect of group, $F(1, 64) = 6.7$, $p = .01$, partial $\eta^2 = .1$, with patients ($M = 2.02$, $SD = .79$) requesting significantly less social

information on the task than controls ($M = 2.43$, $SD = .49$). There was a significant main effect of time point, $F(2, 63) = 71.8$, $p < .001$, partial $\eta^2 = .7$, but no significant group by time point interaction on additional information needed, $F(2, 63) = .99$, $p = .38$, partial $\eta^2 = .03$. Post-hoc paired contrasts revealed a significant decrease in additional information needed for all participants from the beginning ($M = 2.7$, $SD = .71$) to middle time points ($M = 2.21$, $SD = .7$), $t(65) = 11.14$, $p < .001$, the middle to end time points ($M = 1.78$, $SD = .79$), $t(65) = 8.86$, $p < .001$, and the beginning to end time points, $t(65) = 11.81$, $p < .001$.

Exploratory analyses were conducted for patients with early psychosis to assess relationships between JTC and social cognition, which was measured by the total number of correct responses at the final time points of the 20 items on the modified IPT-15. The number of draws to decision on the easy and difficult Beads Tasks were positively correlated, $r(34) = .8$, $p < .001$. Only the number of draws to decision on the difficult task was significantly related to performance on the modified IPT-15, $r(32) = .43$, $p = .02$, suggesting that more cautious decision-making was associated with better social cognitive abilities. Additional correlations between JTC, social cognition, and clinical characteristics for patients are presented in Table 2.2. After applying the Holm-Bonferroni step-down method for multiple corrections, specific clinical characteristics were significantly associated with social cognition. For instance, among the neurocognitive domains, verbal fluency and processing speed were both positively related to social perception and knowledge, and negative symptoms emerged as the only symptom domain that was negatively related to social perception and knowledge.

2.4 Discussion

2.4.1 Overview of Findings

The results from the present study extend previous research on cognitive biases in psychosis by examining the relevance of JTC and BADE to social processing and decision-making in the early stages of illness, which is a relatively understudied clinical group. Approximately one-third of patients displayed a JTC response on at least one of the Beads Tasks, which is in line with prevalence rates reported in other early psychosis samples (e.g., González et al., 2018). The number of draws to a decision on the difficult

version of the Beads Task was positively associated with performance on the modified IPT-15 for patients. This finding adds to the literature supporting the relationship between JTC and social cognition, and provides unique preliminary evidence that, in addition to ToM, social perception and knowledge is related to hasty decision-making in early psychosis. Performance on social perception and knowledge was also strikingly consistent with previous findings. When accuracy scores from the modified IPT-15, consisting of 20 items, were converted to a percentage to compare accuracy scores from the original IPT-15, consisting of 15 items, early psychosis patients ($n = 32$; $M = 57.5\%$, $SD = 12.5\%$) demonstrated nearly identical performance to a sample of chronic patients ($n = 72$; $M = 58\%$, $SD = 11.33\%$) in a study by Vaskinn et al. (2009). Therefore, even with modifications to the administration of the IPT-15, impairments in social perception and knowledge, like other domains of social cognition, are prominent after illness onset and do not appear to worsen over time (Green et al., 2011), which further suggests that social perception and knowledge may be a stable deficit trait in psychosis (Addington et al., 2006).

2.4.2 JTC and BADE

Modifications were made to the IPT-15 to establish a naturalistic assessment of JTC in a social context, and patients displayed a response pattern on this task that was consistent with jumping to social conclusions. More specifically, a higher proportion of patients than controls endorsed above average confidence ratings and a below average need for additional information at a time point on the scenarios when social cues were not yet available to make an accurate and informed response. These results provide support for the hypothesis that patients in the early stages of a psychotic illness are hastier in their social decision-making than age and gender-matched controls; that is, they appear to form stronger judgments on limited social information.

A BADE response pattern was also examined based on whether patients had difficulty revising their social judgments in light of novel and potentially contradictory information. As additional social information was revealed over the course of the scenarios on the modified IPT-15, both participant groups generally improved their response accuracy, endorsed higher confidence in their responses, and required

less information for their responses. Taken together, these findings highlight that early psychosis patients were able to update their early and uninformed social judgments at a rate that was similar to controls, and did not appear to exhibit a response pattern that was suggestive of a BADE in a social context.

Although the interactions of between- and within-group factors on performance-related variables were not significant, a visual inspection of the data highlighted an interesting trend that may be worth exploring in future research. For instance, the interaction of group by scenario time point on accuracy approached significance (see Figure 2.2), and it appeared as though differences in accuracy between patients and controls were least evident by the middle time points, but then most evident by the final time points, when patients exhibited an unexpected decrease in social cognitive performance. One explanation for the lack of consistent improvement in performance over time may be understood with the “liberal acceptance account of psychosis” (Moritz & Woodward, 2004), which suggests that patients do not tend to converge on a particular interpretation of a situation when multiple interpretations are available. Although patients often require less evidence, which can manifest in a JTC bias, requiring less evidence occurs only when few alternatives are present and one of the options is distinct in its probability (Moritz, Woodward, & Lambert, 2007). Therefore, unlike the Beads Task where there are only two competing, but mutually exclusive, response options, the modified IPT-15 presented a range of social stimuli with high ambiguity, and response options that were less distinct in their probability (e.g., “*Who is the woman talking to on the phone?*” A) Her mother; B) A female friend; C) Her boyfriend). Therefore, as more social stimuli were revealed over the course of the IPT-15 scenarios, this may have led patients to consider multiple options as being acceptable, and ultimately readjust their responses by the final time points of the scenarios.

2.4.3 Neurocognition and Symptoms

Other notable results emerged from the exploratory analyses of social cognition and clinical characteristics in early psychosis. With respect to neurocognitive performance, processing speed was significantly associated with social perception and knowledge, which was similarly reported by Penn,

Mueser, Spaulding, Hope, and Reed (1995) in a sample of patients with long-standing illness. The relationship between these two variables is unsurprising given that processing speed, in particular, reflects the most robust domain of neurocognitive impairment in schizophrenia (Dickinson, Ramsey, & Gold, 2007), and may be a core deficit that underlies difficulties in other cognitive domains for patients in the initial (Rodríguez-Sánchez, Crespo-Facorro, González-Blanch, Pérez-Iglesias, & Vázquez-Barquero, 2007) and later stages of illness (Ojeda et al., 2012).

Verbal fluency was the only other neurocognitive domain that displayed a strong relationship with social perception and knowledge. Although processing speed and verbal fluency are traditionally conceptualized as non-overlapping constructs, the method to evaluate verbal fluency in the present study, and many others, involves having respondents generate as many words as possible that begin with a specific letter within a predetermined time limit. Given the time-sensitive nature of the task, rapid and efficient processing is inherently required for optimal performance, and research has supported this claim by demonstrating that verbal fluency indeed loads onto a factor of processing speed (Keefe et al., 2004). Therefore, these two domains of neurocognition tap into an information processing inefficiency that seems to be highly relevant to perceiving and accurately interpreting social information. Further support for the central role of processing speed to social cognition is underscored by preliminary findings that suggest targeting this domain of neurocognition yields significant improvements in social cognitive abilities for individuals at clinical high risk for psychosis or patients in the early stages of illness who were enrolled in a three-month processing speed training intervention (Peters et al., 2017).

With respect to clinical symptoms, negative, but not positive, symptoms were negatively related to social perception and knowledge. In accordance with these findings, it has been generally reported that negative symptoms are associated with social cognitive abilities to a greater extent than positive symptoms in early psychosis (Healey et al., 2016). The social withdrawal that characterizes negative symptoms may reduce opportunities for individuals to practice and refine social skills, thereby impairing social cognitive abilities. Alternatively, it may be that poor social cognitive abilities create significant challenges during social interactions which contributes to increased social isolation and withdrawal.

These interpretations, however, must be taken with caution, given that correlations between psychotic symptomatology and social cognition in the early stages of illness are mixed and remain inconclusive (Healey et al., 2016). Finally, delusional conviction is traditionally associated with JTC (Garety et al., 2005), but the non-significant findings between the BPRS positive symptom domain and JTC in this study may be explained by the broad assessment of psychotic symptoms using the BPRS, and the lack of a specific measure to examine delusional ideation and its relationship with JTC.

2.4.4 Performance Differences between Patients and Controls

To better understand social cognitive processing and performance in psychosis, it is worth reflecting on the differences between patients and controls on aspects of their response patterns. Patients had lower overall accuracy and requested significantly less social information on the modified IPT-15, but did not differ from controls in terms of overall confidence ratings. Interestingly, a similar trend was observed in another study of JTC in which patients with long-standing psychosis displayed confidence ratings of response options that were comparable to controls, but poorer accuracy when they were asked to decide on a response option (Moritz & Woodward, 2006). By examining confidence and decision-making as dissociable constructs, the authors could determine the point at which confidence ratings translated into decisions, and they identified that patients, but not controls, based their decisions on lower confidence ratings, despite similar overall confidence ratings between groups. Thus, confidence ratings about responses on the modified IPT-15 may be informative but only when taking into account decision-making. In the present study, patients and controls endorsed comparable confidence ratings on their responses across the social cognitive task, yet their need for additional information significantly differed, and it could be argued this latter variable reflects an alternative approach for examining decision-making. For instance, indicating a lower need for additional information, particularly early on in the social scenarios, may be interpreted as greater decisiveness in one's response.

While these conclusions remain speculative, the combination of high confidence and low additional information needed at a premature time point were criteria used to define JTC response on the

modified IPT-15, and this was believed to be relevant for understanding differences in accuracy between patients and controls. In fact, a post-hoc analysis demonstrated that patients and controls who jumped to social conclusions had lower accuracy on the modified IPT-15 compared to participants who were less confident and acknowledged needing additional information early on in the social scenarios. Therefore, it appears as though, regardless of clinical status, an initial state of high confidence and decisiveness in social contexts may have important consequences for the later identification and interpretation of social information.

2.4.5 Strengths and Limitations

Much of the previous literature on social cognition in psychosis has focused on the magnitude and stability of impairment across domains and phases of illness. These studies have been critical to advancing our understanding that individuals with psychosis exhibit reliable impairments on most domains of social cognition (see Healey et al., 2016 for a review), and these impairments are pronounced in both the early and chronic phases of illness, based on cross-sectional (Green et al., 2011) and longitudinal (Horan et al., 2011) data. Nevertheless, the aforementioned research has exclusively focused on accuracy as a primary outcome measure and has not addressed the underlying process(es) involved in achieving such performance.

The present study represents the first attempt to explore the processes that patients with psychosis employ to complete a social cognitive task by examining three performance-related variables (accuracy, confidence, and amount of additional social information needed) over the course of the task. Additionally, the use of video-based social scenarios in the IPT-15 allowed for a naturalistic assessment of JTC. As such, results from the present study provide further evidence that JTC is not bound to task-specific features of the Beads Task, and that this response pattern extends to processing real-world social contexts.

The results of the present study should be considered in the context of limitations and future considerations. Early psychosis patients in the present sample were clinically stable at the time of testing, and as a group had mild symptom levels, notably on the BPRS positive symptom domain. This domain

comprises hallucinations, unusual thinking patterns, and suspiciousness; however, there was no measure in the assessment battery to account for delusional severity, which may be a key factor to consider when examining JTC and BADE. For instance, research points to the importance of delusional severity for the JTC bias in early psychosis (Falcone et al., 2014), and a recent meta-analysis supports the role of delusions, rather than a primary psychotic diagnosis, as being related to the presence of JTC (McLean, Mattiske, & Balzan, 2017). Future research may therefore wish to explore whether similar results would be obtained in a more homogenous clinical sample characterized by greater delusional symptoms.

Another potential limitation was that participants were not explicitly asked to rate the exact time point at which they achieved a definitive response on the modified IPT-15, as this would have introduced greater variability in the task administration, and may have compromised how participants approached the task. Therefore, even though a greater proportion of patients displayed a JTC response, it remains unclear if participants had actually reached a firm conclusion, and the point at which this occurred during the scenarios.

Finally, the lack of information on the psychometric properties of the modified IPT-15 may pose an issue for the accuracy and reproducibility of the present results. Moreover, issues with the internal validity of the IPT-15 were documented in an initial validation study, where the internal consistency yielded a KR-20 value of .38, which the study authors attributed to the diversity of the social scenarios and low number of test items (Costanzo & Archer, 1993). Although low internal consistency raises concerns about whether the IPT-15 is assessing a single or multidimensional construct, social perception and knowledge is broadly defined and reflects an underrepresented domain of social cognition, given the few assessment options with strong psychometric support to adequately assess this domain (Pinkham et al., 2015). A major advantage to the IPT-15 is its high degree of face validity since it incorporates stimuli that are representative of common social situations encountered in daily life. Thus, there is a clear trade-off between the ecological validity and psychometric standards of this measure (Vaskinn et al., 2009).

2.4.6 Clinical Implications and Future Research

The impairments in social perception and knowledge observed in early psychosis appear to be partly explained by JTC, given this response pattern was associated with the accuracy of social judgments in the present study. Several other factors that may facilitate accurate social cognition, yet they are often overlooked in the psychosis literature. For instance, the Affect Infusion Model (Forgas, 2001), originating from the field of social psychology, is an information processing theory that has been applied to understanding decision-making on social cognitive tasks in non-clinical populations. This theory emphasizes the importance of task-related features (e.g., familiarity, typicality, complexity, difficulty), person-related features (e.g., goals, personal relevance, cognitive capacity, affective state), and situation-related features (e.g., social desirability, need for accuracy) that directly influence the processing choices of individuals on tasks of social cognition. Given the comprehensive view of this theory, it is evident that, in addition to cognitive biases, there are many potential avenues for future research to investigate a range of factors that may underlie and contribute to social cognitive impairment in psychosis.

Additionally, considering the well-established relationship between social cognition and everyday functioning, the present findings bring into question the degree to which JTC is tied to functional disability. There is some data to indicate that reductions in JTC predict improvements in vocational outcomes for schizophrenia patients over a six-month period even after accounting for positive symptoms and neurocognition (Andreou et al., 2014). However, more studies are needed to explore whether hasty decision-making in social cognition translates to impairment in real-world functional outcomes, such as social, academic, and/or workplace settings.

It is also relevant to note that JTC represents an important therapeutic target that might be modifiable through intervention (Evans, Averbek, & Furl, 2015). Indeed, efforts to address hasty decision-making in psychosis have been embedded in existing psychosocial treatments, such as Social Cognition and Interaction Training (Penn, Roberts, Combs, & Sterne, 2007) and Metacognitive Training (Moritz & Woodward, 2007), which attempt to instill greater doubt in patients by training them to separate facts from guesses, reconsider initial social judgments, and encourage increased time on

processing information. Training programs that aim to ameliorate the JTC bias might prove to be a useful adjunct to established treatments, especially if future studies show that JTC is directly implicated in the psychosocial outcomes of patients.

2.4.7 Conclusions

Based on the results from the present study, a JTC response pattern extends to social contexts, and is disproportionately represented in early psychosis patients relative to community controls. Interestingly, a tendency to jump to early and premature social conclusions, regardless of clinical status, had consequences for overall task performance, given that participants who exhibited this initial response pattern had significantly poorer accuracy at the final time points across IPT-15 scenarios compared to those who did not. The lack of support for a BADE, as evidenced by the significant changes in performance-related variables over the course of the social cognitive task, suggests that patients collected and integrated evidence from the IPT-15 scenarios to substantiate their social judgments, even if that evidence disconfirmed their previously held beliefs. Taken together, these findings demonstrate that JTC, but not BADE, played a role in the processing of social stimuli, and may be more informative of difficulties with social perception and knowledge than the presence of psychosis, per se. However, this latter hypothesis requires further testing using diverse assessment tools and patient groups to determine whether a JTC response generalizes to other social cognitive domains and samples. A better understanding of the situations that give rise to JTC, and the processes underlying this response pattern, would undoubtedly assist in improving intervention efforts for patients with psychosis.

Figure 2.1. Sample Response Form for the Modified Version of the IPT-15

<p><i>Circle the correct answer at this point.</i></p> <p>A B C</p>	<p><i>How confident are you in your answer?</i></p> <p>(0 = Completely Unconfident/Uncertain - 100 = Completely Confident/Certain)</p> <p>0 10 20 30 40 50 60 70 80 90 100</p>	<p><i>How much more information do you need?</i></p> <p>0 1 2 3 4</p> <p>None Very little Somewhat Quite a bit A great deal</p>
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<p><i>Circle the correct answer at this point.</i></p> <p>A B C</p>	<p><i>How confident are you in your answer?</i></p> <p>(0 = Completely Unconfident/Uncertain - 100 = Completely Confident/Certain)</p> <p>0 10 20 30 40 50 60 70 80 90 100</p>	<p><i>How much more information do you need?</i></p> <p>0 1 2 3 4</p> <p>None Very little Somewhat Quite a bit A great deal</p>
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<p><i>Circle the correct answer at this point.</i></p> <p>A B C</p>	<p><i>How confident are you in your answer?</i></p> <p>(0 = Completely Unconfident/Uncertain - 100 = Completely Confident/Certain)</p> <p>0 10 20 30 40 50 60 70 80 90 100</p>	<p><i>How much more information do you need?</i></p> <p>0 1 2 3 4</p> <p>None Very little Somewhat Quite a bit A great deal</p>
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Table 2.1. Demographic and Clinical Characteristics of Study Participants

Characteristic	Early Psychosis (<i>n</i> = 35)	Community Controls (<i>n</i> = 35)	Test statistic	<i>p</i> value	Partial η^2
Age	23.57 (5.08)	23.34 (4.61)	$F(1, 68) = .04$	.84	.001
Sex (<i>n</i> , % Male)	29 (82.9%)	25 (71.4%)	$\chi^2(1) = 1.3$	.26	
Ethnicity (<i>n</i> , % Caucasian)	29 (82.9%)	27 (77.1%)	$\chi^2(1) = .36$	.55	
Primary diagnosis (<i>n</i> , %)					
Non-affective psychosis	24 (68.6)				
Affective psychosis	11 (31.4)				
Antipsychotic medication (<i>n</i> , %)					
Typical	0 (0%)				
Atypical ^a	30 (85.7%)				
Unmedicated	1 (2.9%)				
Age at first hospitalization (years)	21.79 (5.17) [28]				
Age at program entry (years)	22.78 (5.24)				
Education (years)	12.66 (2.24)	14.31 (1.92)	$F(1, 68) = 11.06$	.001	.14
Independent living (<i>n</i> , %)	11 (31.4%)	30 (85.7%)	$\chi^2(1) = 21.25$	< .001	
Hollingshead current occupation level ^b	7.6 (1.31)	6.46 (2.32)	$F(1, 68) = 6.45$	.01	.09
Hollingshead highest occupation level ^b	6.09 (1.54)	5.17 (1.65)	$F(1, 68) = 5.73$	.02	.08
WRAT-3	-.04 (.78)	.49 (.57)	$F(1, 68) = 10.18$	.002	.13
SCIP total	-.76 (1.09)	.07 (.53)	$F(1, 68) = 16.27$	< .001	.19
Beads task					
JTC 85:15 (<i>n</i> , %)	11 (31.4%)	4 (11.8%) [34]	$\chi^2(1) = 3.92$	.05	
JTC 60:40 (<i>n</i> , %)	6 (17.6%) [34]	1 (2.9%) [34]	$\chi^2(1) = 3.98$	.05	
BPRS symptom dimensions					
Manic–excitement	1.49 (.54)	1.13 (.15)	$F(1, 68) = 13.91$	< .001	.17
Negative	1.90 (.84)	1.05 (.16)	$F(1, 68) = 34.38$	< .001	.34
Positive	1.91 (1.12)	1 (0)	$F(1, 68) = 23.15$	< .001	.25
Depression–anxiety	3.07 (1.44)	1.57 (.55)	$F(1, 68) = 33.13$	< .001	.33
BPRS total	35.63 (10.01)	22.31 (2.84)	$F(1, 68) = 56.44$	< .001	.45
SDS	4.18 (2.27)	1.57 (1.19)	$F(1, 68) = 36.26$	< .001	.35

Note: Bolded values indicate $p < .05$. [*n*] denotes number of participants with available data. ^aThree individuals were taking more than one atypical antipsychotic medication. ^bSmaller values indicate higher occupational rankings. WRAT-3, Wide Range Achievement Test—Reading Recognition Subtest; SCIP, Screen for Cognitive Impairment in Psychiatry; JTC, Jumping to Conclusions; BPRS, Brief Psychiatric Rating Scale; SDS, Sheehan Disability Scale.

Figure 2.2. Group by Time Point on Mean Accuracy Scores on the Modified IPT-15

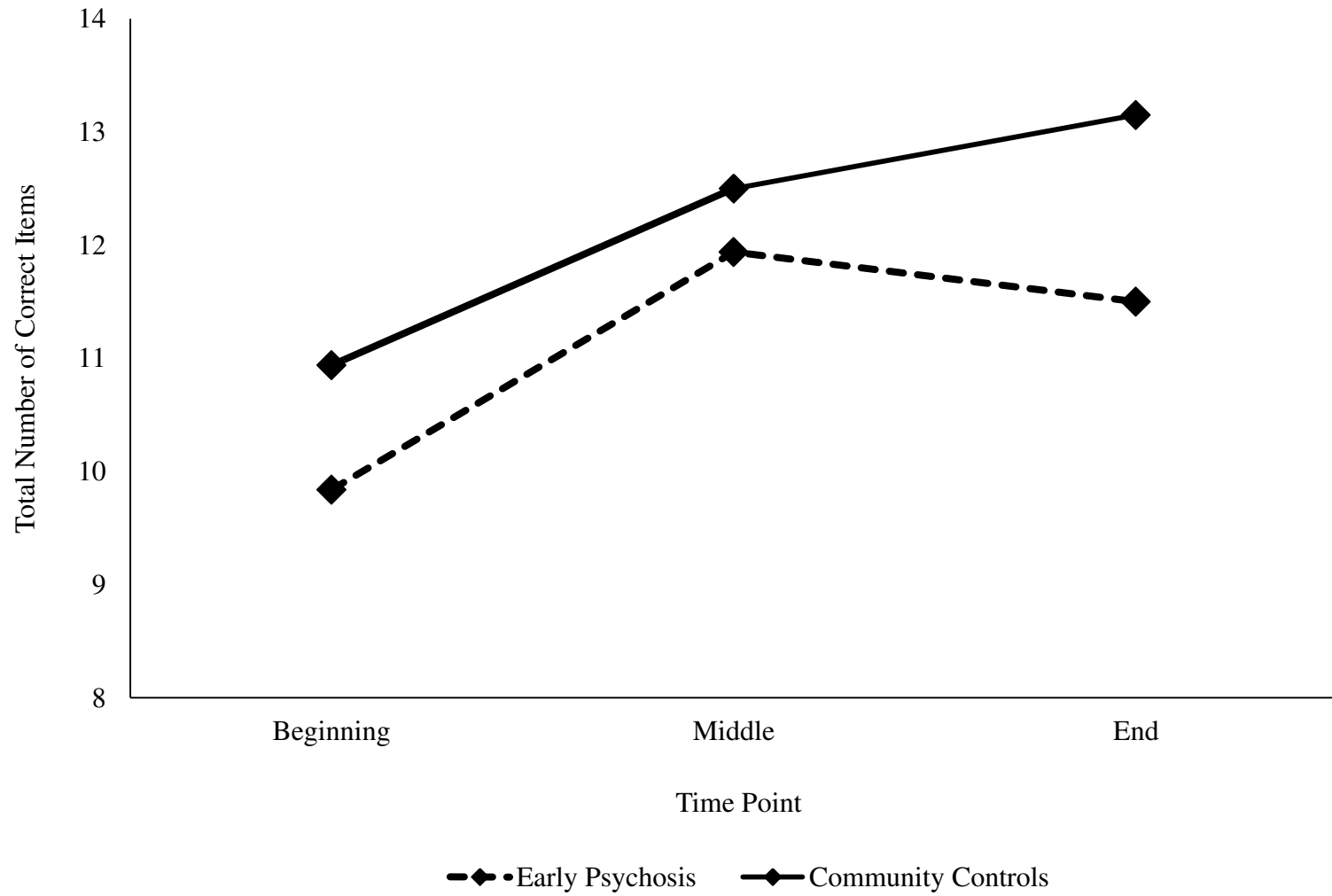


Figure 2.3. Group by Time Point on Mean Confidence Ratings on the Modified IPT-15

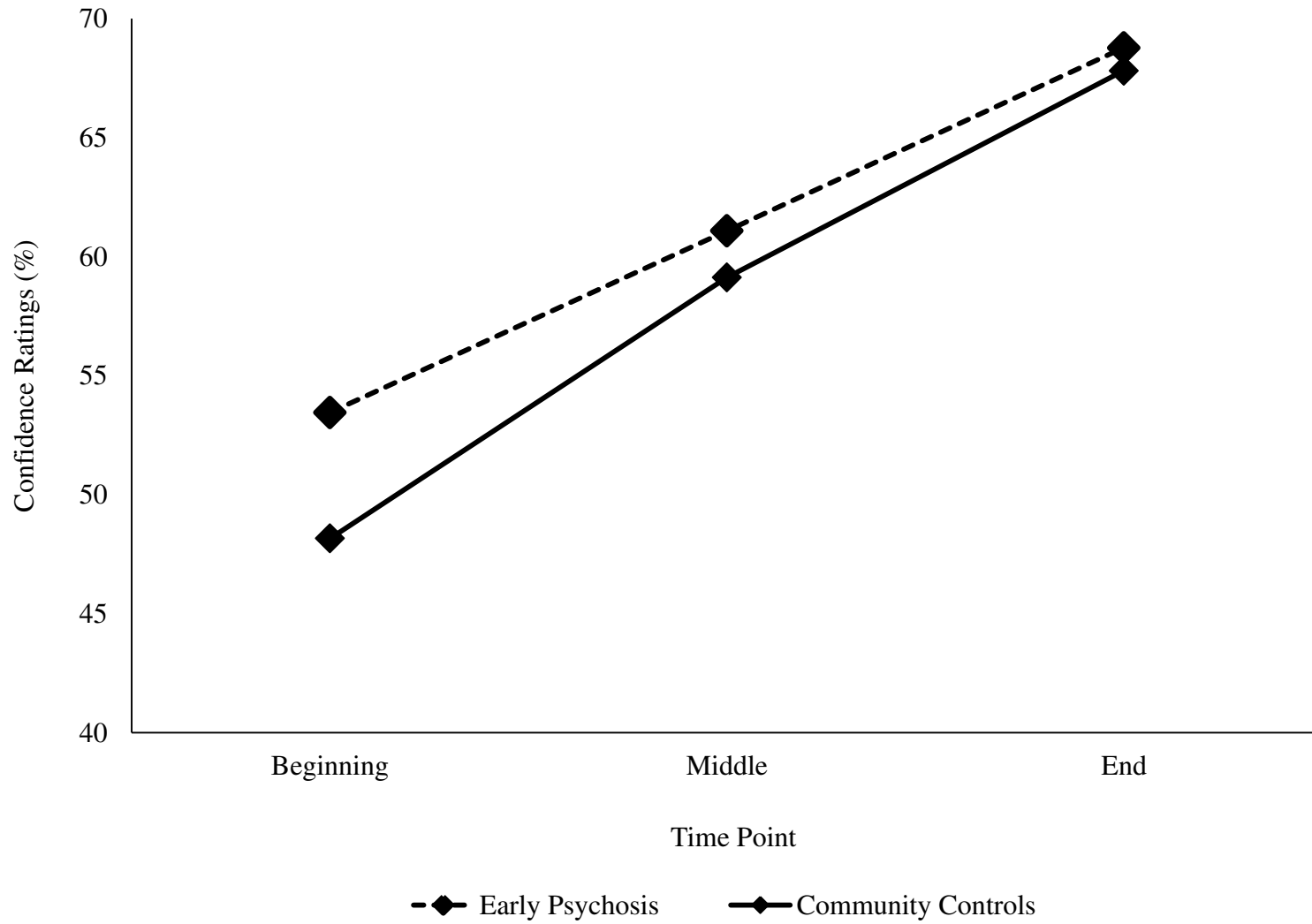


Figure 2.4. Group by Time Point on Mean Amount of Additional Information Needed on the Modified IPT-15

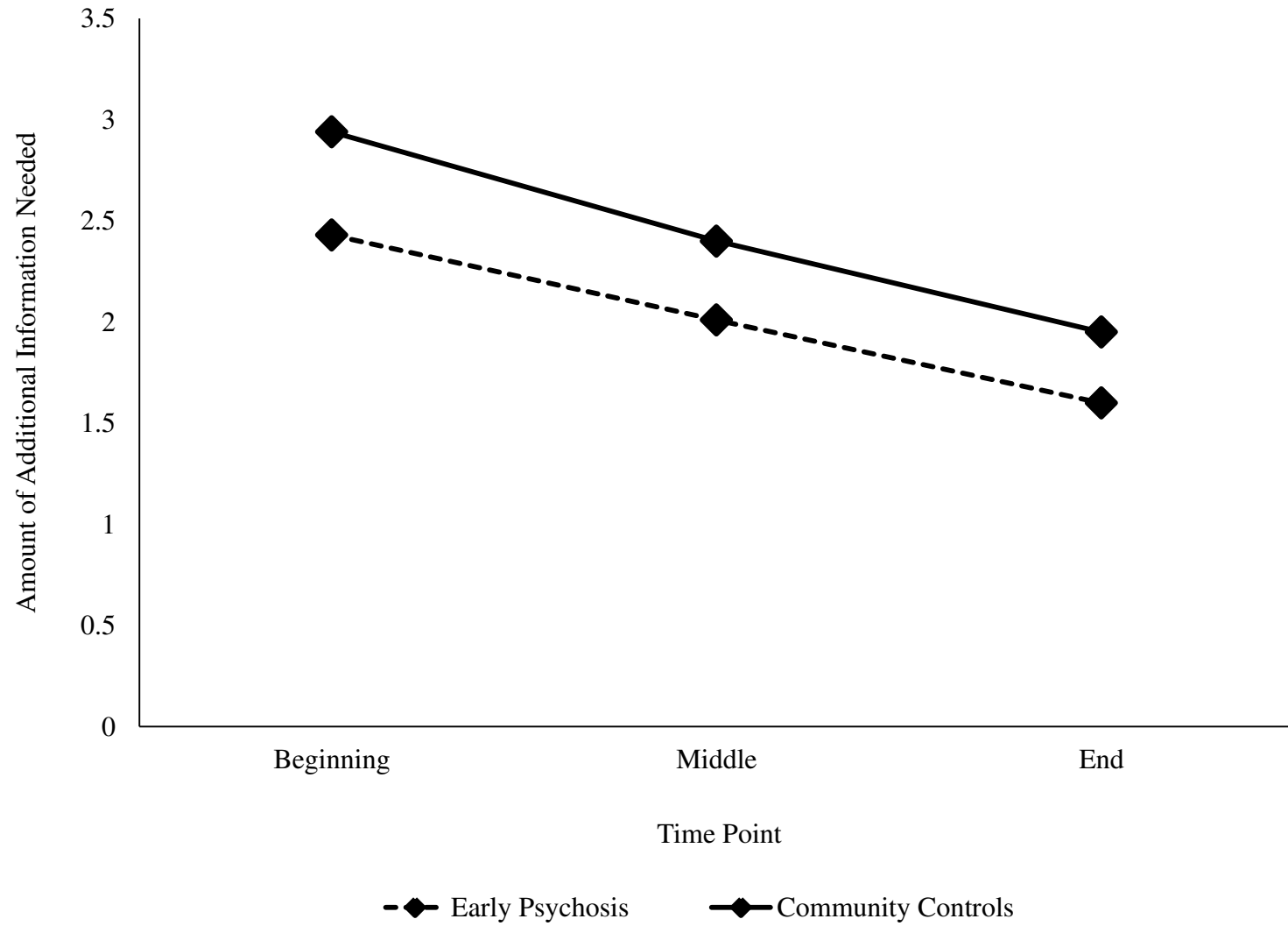


Table 2.2. Correlations between Draws to Decision, Social Cognition, and Clinical Characteristics for Early Psychosis Patients

Characteristic	JTC 85:15 Draws to Decision (<i>n</i> = 35)		JTC 60:40 Draws to Decision (<i>n</i> = 34)		Total correct items on modified IPT-15 (<i>n</i> = 32)	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
WRAT-3	.19	.28	.34	.05	.36	.04
SCIP neurocognitive domains						
Immediate verbal learning	.02	.93	.4	.02	.32	.07
Delayed verbal learning	.03	.88	.28	.11	.27	.14
Working memory	-.09	.6	.35	.04	.36	.05
Verbal fluency	.15	.4	.33	.06	.52	.002*
Processing speed	.1	.58	.37	.03	.53	.002*
SCIP total	-.05	.8	.3	.08	.15	.43
BPRS symptom dimensions						
Manic–excitement	-.16	.35	-.31	.07	-.38	.03
Negative	-.3	.08	-.4	.02	-.49	.005*
Positive	-.09	.61	-.29	.09	-.06	.75
Depression–anxiety	.23	.19	.18	.32	.24	.18
BPRS total	-.08	.64	-.26	.13	-.19	.3

Note: JTC, Jumping to Conclusions; IPT-15, Interpersonal Perception Task; WRAT-3, Wide Range Achievement Test—Reading Recognition Subtest; SCIP, Screen for Cognitive Impairment in Psychiatry; BPRS, Brief Psychiatric Rating Scale; SDS, Sheehan Disability Scale. *Significant correlations after applying a family-wise correction for multiple comparisons using the Holm-Bonferroni step-down method.

Chapter 3

Money Talks: The Influence of Extrinsic Motivators on Social Cognition in Early Episode Psychosis

3.1 Introduction

Social cognition has gained widespread acceptance as one of the most consistent and proximal determinants of functioning in psychotic disorders (Schmidt et al., 2011), making it an important treatment target and highly implicated in the course and outcome of illness (Horan et al., 2011). Often regarded as a multidimensional construct, social cognition comprises four key domains (emotion perception, social perception and knowledge, theory of mind [ToM], and attributional styles or biases; Green et al., 2008), and difficulties across domains have been reliably documented in patients, regardless of symptom severity or illness phase (Green et al., 2011). Even by the first episode of psychosis, the magnitude of impairment in social cognition ($d = 1.0$; Bora & Pantelis, 2013) is comparable to patients with long-standing illness ($d = 1.1$; Bora et al., 2009) and more severe than deficits observed in global neurocognition ($d = .91$; Mesholam-Gately et al., 2009).

Although research has traditionally prioritized the study of neurocognition given its well-established and robust association with everyday functioning (Couture et al., 2006; Green et al., 2004), social cognition has been shown to be a distinct construct that is more closely related to functional outcomes. The importance of social cognition has been underscored by meta-analytic findings that suggest domains of social cognition, notably ToM, explain variance in community functioning beyond that of global neurocognition (16% vs. 6%, respectively; Fett et al., 2011). Despite a growing awareness of the functional relevance of social cognition, surprisingly limited research has been devoted to examining the nature and complexity of social cognitive abilities, and delineating the degree to which other factors contribute to compromised performance in patients with psychosis (Abu-Akel & Shamay-Tsoory, 2013).

In recent years, amotivation has emerged as an illness-related factor that is uniquely related to neurocognition (Foussias et al., 2015) and social cognition (Fervaha, Siddiqui, Foussias, Agid, & Remington, 2015), which may have implications for understanding the development of these impairments and their direct and indirect association with functional outcomes (Bhagyavathi et al., 2015). Amotivation is a negative symptom domain of psychosis that broadly refers to a loss or absence of goal-directed behaviour (Foussias & Remington, 2008). Significant reductions in motivation are already detected by the early stages of illness (Fulford et al., 2013; Milev, Ho, Arndt, & Andreasen, 2005) and can limit the effectiveness of rehabilitation efforts, posing a barrier to functional recovery for patients (Kremen, Fiszdon, Kurtz, Silverstein, & Choi, 2016). In one study, over 75% of individuals with early psychosis endorsed motivational difficulties, which were identified as the strongest predictor of concurrent and longitudinal functioning (Fervaha, Foussias, Agid, & Remington, 2015).

There is conflicting evidence that amotivation can be conceptualized as both contributing to and resulting from impaired cognitive functions. One theoretical model has proposed that poor neurocognitive and social cognitive performance undermines goal-directed behaviour, which subsequently leads to functional difficulties for patients. This model has received substantial empirical support since amotivation has been consistently shown to mediate the relationship between neurocognition (Ventura et al., 2009) or social cognition (Gard et al., 2009) and real-world functioning. Alternatively, it has been hypothesized that amotivation during testing on cognitive tasks may account for poor neurocognitive and social cognitive performance, which, in turn, impacts functional outcomes. Moreover, low performance on cognitively demanding tasks may reflect reduced effort during testing which can mask true abilities and potentially overestimate existing impairments. Consistent with this hypothesis, several studies have highlighted that low effort is predictive of global neurocognition (Strauss, Morra, Sullivan, & Gold, 2015), and changes in motivation have been shown to account for 6-16% of the variance in changes in neurocognitive performance (Fervaha et al., 2014). A more nuanced model was documented in one study, where motivation predicted neurocognitive performance through its relationship with effort expended during cognitive testing (Foussias et al., 2015).

Experimental manipulations can help elucidate the causal effects of motivation on neurocognition, and accumulating data over the past few decades suggests that extrinsic motivators can favourably influence neurocognitive abilities under certain conditions. The use of monetary rewards in combination with enhanced task instructions have been found to improve performance on measures of executive functioning (Green, Satz, Ganzell, & Vaclav, 1992) and information processing (Kern, Green, & Goldstein, 1995) for patients with psychosis, providing further support that neurocognitive performance can be partly explained by motivational factors during testing. However, the findings are equivocal for whether monetary rewards on their own have a remediating effect on neurocognitive deficits, which is likely due to inconsistencies reported across studies. More specifically, the variability in reward salience, sample size, type of comparison groups, neurocognitive domains and/or measures used, and whether or not negative reinforcements are included, prevent any definitive conclusions of the specific motivational factors involved in shaping neurocognitive performance (Bellack, Mueser, Morrison, Tierney, & Podell, 1990; Hellman, Kern, Neilson, & Green, 1998; Summerfelt, Alphas, Funderburk, Strauss, & Wagman, 1991; Thornton et al., 2007).

Fewer studies have applied extrinsic motivators to tasks of social cognition, yet there is reason to believe that similar motivational processes involved in neurocognitive testing would extend to tasks of social cognition. Cross-sectional data has shown that motivational deficits are associated with domains of social cognition in early (Vohs et al., 2014) and chronic (Ventura, Wood, & Helleman, 2011) samples, and small, positive relationships have been found between motivation and all four social cognitive domains, with correlations ranging from .21 to .33 (Mehta, Bhagyavathi, & Thirthalli, 2015). Of the experimental studies conducted, only one research group reported that performance on an emotion perception task was improved for patients with psychosis who received a single-session intervention of monetary rewards, facial feedback, or a combination of both, and these performance gains were maintained over a one-week follow-up period (Penn & Combs, 2000). Results from this study led to the development of an attention-shaping intervention, which demonstrated efficacy in enhancing emotion

perception abilities with or without the use of monetary rewards (Combs et al., 2008; Combs, Chapman, Waguspack, Basso, & Penn, 2011).

Monetary rewards and corrective feedback appear to play a role in emotion perception for patients with psychosis. Nevertheless, it remains unknown whether other domains of social cognition are similarly affected by motivational impairments inherent to the illness, and if performance on a task of ToM can be ameliorated with the use of extrinsic motivators. Additionally, because previous research has largely relied on cross-sectional data in chronic samples, more experimental studies are needed to confirm whether a causal, linear relationship exists between motivational factors and social cognitive performance across different stages of illness (Stanghellini & Ballerini, 2011).

In light of these gaps in the literature, the primary aim of the present study was to examine the influence of monetary reinforcement and corrective feedback on ToM performance in a sample of patients in the early stages of psychosis relative to age-matched community controls. A main effect of group on overall ToM performance was hypothesized, such that community controls would exhibit significantly better social cognition than early psychosis patients. It was also anticipated that ToM performance would be significantly higher for community controls in the monetary reward vs. non-reward condition, and that performance for the patient group would be significantly higher in the monetary reward vs. non-reward condition. In terms of an interaction effect, it was predicted that ToM performance would be highest for community controls who received monetary rewards and lowest for patients who were unrewarded for their ToM performance.

3.2 Method

3.2.1 Participants

The study comprised 70 participants: 35 early psychosis outpatients and 35 community controls. A total of 43 outpatients receiving treatment at an early intervention program in Kingston, Ontario were initially recruited. All individuals enrolled in this specialized clinical service who were in the early stages of their illness were eligible for participation. Participants were excluded on the basis of having a non-

psychotic primary diagnosis ($n = 1$) or substance-induced psychosis ($n = 7$). Additional exclusion criteria defined prior to the study were: illness duration exceeding five years, a history of head injury or neurological condition, or non-fluent in English as determined by referring case managers. The final sample of early psychosis participants ($N = 35$) ranged in age from 16 to 37 years ($M = 23.57$, $SD = 5.08$) and were mostly comprised of males ($n = 29$; 83%). All patients had a non-affective ($n = 24$; 69%) or affective ($n = 11$; 31%) psychotic disorder, and were diagnosed according to DSM-IV criteria (American Psychiatric Association, 2010) with the following conditions: schizophrenia ($n = 14$; 40%), bipolar disorder with psychotic features ($n = 8$; 22.9%), schizoaffective disorder ($n = 3$; 8.6%), schizophreniform ($n = 3$; 8.6%), psychosis not otherwise specified ($n = 3$; 8.6%), delusional disorder ($n = 2$; 5.7%), and major depressive disorder with psychotic features ($n = 2$; 5.7%).

Thirty-six community controls were recruited through advertisements posted in the community and online, and were age- and gender-matched to the outpatient cohort. One participant was removed from all analyses due to questionable response patterns as described in the Data Analysis section, resulting in a final sample of 35 community controls. The majority of participants were male ($n = 25$; 71%) with a mean age of 23.34 ($SD = 4.61$; $range = 18-34$). In addition to the above exclusion criteria, community controls were screened for past or current psychiatric disorders prior to study enrollment. All community controls denied having any psychiatric diagnoses, and were not taking any medications at the time of testing.

3.2.2 Measures

3.2.2.1 Demographics

A structured form was used to gather demographic information from both self-report and medical health records. Psychiatric diagnoses and medication data were collected for the patient cohort.

3.2.2.2 Psychiatric history

The Structured Clinical Interview for DSM-IV, Axis I Disorders (SCID-I; First et al., 2002) is a highly reliable and valid clinical interview instrument that is widely recognized as the gold standard for

assessing psychiatric disorders for clinical research purposes. Given the full interview takes several hours to administer, relevant modules of the SCID-I were used to assess past or current symptoms of Axis I Disorders in community controls, including the mood, psychosis, and substance use and dependence modules.

3.2.2.3 Psychiatric symptoms

The Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962) is a semi-structured interview of psychopathology, with ratings based on symptoms over the past two weeks and behavioural observations made during the interview. The BPRS assesses the presence and severity of 18 psychiatric symptom domains, such as anxiety, depressed mood, suspiciousness, and grandiosity on a 7-point Likert scale, ranging from “Not Present” to “Extremely Severe.” Item ratings were aggregated to compute a total psychopathology score, and four symptom dimensions (manic-excitement, negative, positive symptoms, depression-anxiety) were based on mean scores from a factor analysis on the BPRS conducted in an early psychosis sample (Ventura et al., 2000).

3.2.2.4 Estimated premorbid intelligence

The Wide Range Achievement Test—Reading Recognition Subtest (WRAT-3; Wilkinson, 1993) requires examinees to read a list of words of increasing complexity, and provides an estimate of premorbid intelligence based on age-matched normative data.

3.2.2.5 Neurocognition

The Screen for Cognitive Impairment in Psychiatry (SCIP; Purdon, 2005) is a paper-and-pencil screening assessment designed to provide a brief examination of neurocognitive abilities that are commonly impaired in psychiatric disorders. Total administration time is under 20 minutes. The five subtests of the SCIP include: immediate and delayed verbal learning, working memory, verbal fluency, and processing speed. A global neurocognition score is derived by averaging performance across these five subtests. Raw scores were converted to standard scores based on normative data from a validation study of 185 university-aged participants (Purdon, 2005).

3.2.2.6 Social cognition

The Awareness of Social Inference Test, Part III (TASIT; McDonald, Flanagan, Rollins, & Kinch, 2003) is a clinical assessment of ToM that comprises videotaped vignettes of everyday social interactions. Respondents view 16 vignettes that require an understanding of the intentions, beliefs, and meanings of the speakers to determine whether conversational exchanges are meant literally or non-literally. Four standard questions per vignette are presented in a forced-choice format (e.g., yes/no/don't know), and respondents are asked about specific components of the social interactions: the intention of a speaker (i.e., what someone is *doing*), the message a speaker is hoping to convey (i.e., what someone is *saying*), the true beliefs of a speaker (i.e., what someone is *thinking*), and the true emotional state of a speaker (i.e., what someone is *feeling*). Half of the conversational exchanges involve lies, whereas the remaining half involve sarcasm, yielding two subscale scores and a total score of overall ToM performance. The TASIT showed adequate psychometric characteristics in a recent validation study of patients with long-standing psychosis (Pinkham et al., 2015). Raw scores were converted to standard scores based on normative data from community controls that were demographically-matched to a sample of first episode patients (Green et al., 2011).

3.2.2.7 Self-perception of social cognition

A single question was presented following the administration of the TASIT, asking participants: "How skilled are you at identifying and interpreting the thoughts, feelings, and beliefs of others in social situations?" Response options ranged on a 5-point Likert scale from "Very Unskilled" to "Very Skilled," and were used to quantify self-perceptions of ToM ability.

3.2.2.8 Global functioning

The Sheehan Disability Scale (SDS; Sheehan, Harnett-Sheehan, & Raj, 1996) is a 3-item self-report rating of global functioning in three discrete domains: work/school, social life or leisure activities, and family life or home responsibilities. The SDS is rated on an 11-point Likert scale from "Not at All" to "Extremely," and captures the extent to which clinical symptoms have caused disruptions in functioning

across these domains during the past week. Total scores are calculated by summing the three domain scores, and range from 0 to 30. Respondents have the option of skipping over the work/school domain if they have not worked/studied during the past week for reasons unrelated to clinical symptoms. However, early psychosis patients who skipped over the work/school domain, but also disclosed they were recipients of social assistance during the demographics interview ($n = 6$), provided a conflicting account of their functional impairment. Although total SDS scores (ranging from 0-30) are typically calculated by summing the three domain scores, mean SDS scores (ranging from 0 to 10) were instead calculated by obtaining an average of the domain scores for only those domains that were rated. This alternative method of scoring was used due to the lack of consistency in patient responses on the work/school domain, and has been used by previous investigators (see Weiller et al., 2018 for a summary).

3.2.3 Procedure

The research protocol was approved by the university ethics review board, and written informed consent (or verbal assent for participants younger than 18 years old) was obtained from all participants after study procedures were fully explained. Assessments were conducted by Doctoral-level students or Bachelor-level research assistants who were blinded to the study hypotheses, although telephone screeners and symptom interviews were only administered by Doctoral-level students trained on the SCID-I and BPRS. Diagnoses for patients were extracted from medical health records at the time of testing, and were based on semi-structured clinical interviews conducted by psychiatrists with expertise in early psychosis. Given the inconsistency in clinical presentation during the early stages of psychosis (Cotter et al., 2017), medical health records were reexamined for any patients initially diagnosed with a substance-induced psychotic disorder at approximately one year following their participation in the present study to confirm their diagnostic status.

A computer-generated random number sequence was used for randomization. Prior to study entry, participants were randomly assigned to either a reward or non-reward condition based on whether their number in the sequence was odd or even, respectively. In the reward condition, participants were

instructed they would receive \$0.25 for each correct response on the TASIT, with an opportunity to earn upwards of \$16 (i.e., 16 videotaped vignettes x four questions per vignette x \$0.25 for each correct response). A tangible reward of \$0.25 was placed in a small clear jar next to the participant immediately following each correct response, and a visual representation of total earnings was presented on a printed sheet of paper with \$0.25 increments up to \$16. The assessor continuously monitored correct responses by highlighting the updated total after each vignette, allowing participants to observe and monitor their cumulative earnings over the course of the TASIT. In the non-reward condition, participants received the standard administration of the TASIT without any additional instructions or corrective feedback. All participants were debriefed at the end of the study and remunerated \$15 for their participation, in addition to any earnings received from the TASIT for individuals in the reward condition.

3.2.4 Data Analysis

Data were inspected for normality and outliers prior to any statistical analyses. One community control was removed from the study due to frequency of ‘don’t know’ responses on the TASIT exceeding 3 *SDs* above the mean. One early psychosis patient prematurely discontinued the study, resulting in unavailable data on the TASIT for this individual, who was randomly assigned to the non-reward condition. Between-group comparisons of study participants on demographic and clinical characteristics were performed using Pearson chi-square tests for categorical variables and univariate ANOVAs for continuous variables. These analyses were repeated within both participant groups to characterize individuals randomly assigned to the reward vs. non-reward condition on the TASIT. Non-parametric partial correlations adjusted for condition type were used to evaluate the association between TASIT total scores and clinical characteristics of study participants. Two-way ANCOVAs were conducted to examine the main effects and interaction of group (early psychosis vs. community controls) and condition type (reward vs. non-reward) on the TASIT lie and sarcasm subscales and TASIT total scores, with estimated premorbid intelligence and global neurocognition as covariates. Significant main effects and interactions were followed up with independent samples *t*-tests corrected for multiple comparisons using Bonferroni

corrections (.05/3 = .02). A post-hoc two-way ANCOVA was also conducted on the frequency of ‘don’t know’ responses selected on the TASIT, with estimated premorbid intelligence and global neurocognition as covariates. This exploratory analysis examined the main effects and interaction of group (early psychosis vs. community controls) and condition type (reward vs. non-reward) on this hypothesized proxy measure of effort expended during social cognitive testing. Effect sizes for all analyses were represented with partial eta squared, and conventional definitions of small (.01), medium (.06), and large (.14) effects were used to interpret the findings (Cohen, 1988).

3.3 Results

Demographic and clinical characteristics of study participants are presented in Table 3.1. Early psychosis patients and community controls were well matched on age, sex, and ethnicity, but differed on other demographic variables, including independent living status, years of education, current and highest occupational ranking, and estimated premorbid intelligence. In terms of clinical variables, patients reported greater psychiatric symptom severity, and a higher degree of impairment on global neurocognition and daily functioning relative to controls.

Between-group comparisons of early psychosis patients and community controls as a function of condition type were also examined (see Table 3.2). Similar demographic and clinical characteristics were reported for participants randomized to the reward or non-reward condition on the TASIT in both the clinical and comparison groups. The only observed difference was on the BPRS manic-excitement symptom dimension, where patients in the reward condition reported lower manic-excitement symptoms than patients in the non-reward condition.

Partial correlations between TASIT total scores and clinical variables for both participant groups after adjusting for condition type are presented in Table 3.3. These analyses revealed that social cognition was related to the estimated premorbid intelligence for both clinical and comparison groups. Social cognition was also found to be associated with global neurocognition for controls, but otherwise showed

no relationships with other clinical variables. Interestingly, self-perceptions of social cognitive abilities were related to TASIT total scores at a trend level for patients, but not controls.

Two-way ANCOVAs were conducted to examine the effects of group and condition type on the TASIT subscales (lies and sarcasm) and total scores after adjusting for estimated premorbid intelligence and global neurocognition. Means and standard errors for TASIT measures as a function of group and condition type are reported in Table 3.4.

For the TASIT lie subscale, there were no significant main effects of group, $F(1, 63) = 3.9, p = .05$, partial $\eta^2 = .06$, or condition type, $F(1, 63) = .65, p = .43$, partial $\eta^2 = .01$, on lie subscale scores. The interaction of group and condition type on lie subscale scores was significant, $F(1, 63) = 5.77, p = .02$, partial $\eta^2 = .08$. Post-hoc paired contrasts revealed that patients in the reward condition had higher lie subscale scores than patients in the non-reward condition, though this fell short of the significance threshold after correction for multiple comparisons, $p = .03$. Similar lie subscale scores were reported for community controls in both conditions, $p = .26$. In the non-reward condition, patients performed significantly lower on the lie subscale than controls, $p = .004$, whereas no difference was detected in lie subscale scores between patients and controls in the reward condition, $p = .91$.

For the TASIT sarcasm subscale, a significant main effect of group was found, such that patients ($M = -.54, SE = .15$) had significantly lower sarcasm subscale scores than controls ($M = .40, SE = .15$), $F(1, 63) = 17.98, p < .001$, partial $\eta^2 = .22$. There was no significant main effect of condition type, $F(1, 63) = 3.2, p = .08$, partial $\eta^2 = .05$, and no significant interaction of group and condition type, $F(1, 63) = 2.66, p = .11$, partial $\eta^2 = .04$, on sarcasm subscale scores.

For TASIT total scores, there was a significant main effect for group, and patients ($M = -.86, SE = .15$) exhibited significantly lower total scores than controls ($M = .12, SE = .15$), $F(1, 63) = 18.17, p < .001$, partial $\eta^2 = .22$. The main effect of condition type on total scores was not significant, $F(1, 63) = 3.16, p = .08$, partial $\eta^2 = .05$. The interaction of group and condition type on total scores was significant, $F(1, 63) = 7.76, p = .007$, partial $\eta^2 = .11$ (see Figure 3.1). Post-hoc paired contrasts demonstrated that early psychosis patients in the reward condition had significantly higher total scores than patients in the

non-reward condition, $p = .002$, whereas total scores were consistent between conditions for control participants, $p = .48$. In the non-reward condition, patients displayed significantly lower total scores than controls, $p < .001$, although total scores did not significantly differ between clinical and comparison groups in the reward condition, $p = .17$.

Finally, an exploratory two-way ANCOVA was conducted to examine the effects of group and condition type on the frequency of ‘don’t know’ responses selected on the TASIT after adjusting for estimated premorbid intelligence and global neurocognition. There was a trend level main effect of group, $F(1, 63) = 5.22, p = .03$, partial $\eta^2 = .08$, and a significant main effect of condition type, $F(1, 63) = 12.15, p = .001$, partial $\eta^2 = .16$, indicating that participants in the non-reward condition selected more ‘don’t know’ responses than those in the reward condition, $p = .001$. A significant group by condition type interaction was observed, $F(1, 63) = 6.47, p = .01$, partial $\eta^2 = .09$, and post-hoc paired contrasts revealed differential patterns of ‘don’t know’ responses on the TASIT (see Figure 3.2). Early psychosis patients selected the ‘don’t know’ response option more frequently in the non-reward condition compared to patients in the reward condition, $p < .001$. Condition type was not associated with frequency of ‘don’t know’ responses for community controls, $p = .5$. Although patients in the non-reward condition selected ‘don’t know’ more frequently than controls in the non-reward condition, $p = .002$, there was no difference in the frequency of ‘don’t know’ responses when performance was rewarded for both clinical and comparison groups, $p = .98$.

3.4 Discussion

3.4.1 Overview of Findings

This is the first study to highlight the direct influence of extrinsic motivators on social cognition in early psychosis, and demonstrate that a robust, causal relationship exists between monetary rewards and corrective feedback on ToM performance. As hypothesized, early psychosis patients exhibited lower TASIT scores relative to community controls, and these group differences were particularly salient on social scenarios involving sarcasm, but not scenarios involving lies. Patients displayed higher

performance on the lie subscale and TASIT total scores when rewards were available compared to patients who were not rewarded. These results are in line with those reported by Penn and Combs (2000) who found that monetary rewards enhanced emotion perception, and also provide evidence that more than one domain of social cognition is responsive to extrinsic motivators for patients with psychosis. Contrary to what was hypothesized, extrinsic motivators did not have an influence on ToM performance for control participants, who demonstrated comparable TASIT scores regardless of condition type.

The most striking finding from the present study was the clinical and statistical differences in ToM performance that emerged for patients when task motivation was experimentally manipulated. Although patients performed more than 1 *SD* below the normative mean on the TASIT in the absence of any rewards, this pronounced impairment was no longer evident in a well-matched sample of patients who were exposed to extrinsic motivators. Most notably, ToM performance did not significantly differ between patients and controls who received performance-contingent rewards, even after accounting for estimated premorbid intelligence and global neurocognition which are established correlates of social cognition (Bora et al., 2009). Because control participants had similar TASIT scores irrespective of their condition, these results highlight that monetary rewards and corrective feedback had a facilitative effect on ToM performance that appeared to be specific to patients with early psychosis.

Further support for the hypothesis that amotivation may underestimate actual ToM abilities in early psychosis can be seen in the frequency of ‘don’t know’ responses on the TASIT. Across both participant groups, there was a lower frequency of ‘don’t know’ responses when ToM performance was rewarded, which indicates that participants were more likely to provide a response, even if they lacked certainty, when rewards were available. However, only patients displayed an increased frequency of ‘don’t know’ responses in the non-reward vs. reward condition, suggesting that extrinsic motivators reveal true ability in ToM in early psychosis patients.

3.4.2 Monetary Rewards and Effort

Effort-based decision-making is a cognitive process that underlies goal-directed behaviour, and can provide a useful framework for understanding the motivational factors that led to ToM differences between the study conditions for patients. According to Green, Horan, Barch, and Gold (2015), effort-cost computations refer to the level of effort a person is willing to exert for a given reward. These computations involve two broad processes related to *valuation* and *effort*, both of which can be broken down into further subprocesses and examined in the context of the present study.

For *valuation*, a person must generate a mental representation of the value of the reward based on its magnitude and probability of occurrence, and maintain that representation long enough to guide behaviour. Although the literature is mixed as to whether monetary rewards on their own can reliably modify performance on neurocognitive testing in psychosis (Barch, Yodkovik, Sypher-Locke, & Hanewinkel, 2008), the salience of the \$0.25 monetary reward, and its occurrence after every correct response, may have produced a high valuation of the TASIT for patients in the present study. Indeed, lower rates of compensation were reported in previous studies that did not observe improvements in neurocognitive performance with the use of extrinsic motivators alone, notably when rewards ranged from \$0.02 to \$0.10 per correct response (Bellack et al., 1990; Green et al., 1992; Hellman et al., 1998). To help patients maintain their reward representation, tangible rewards after each correct response and continuous monitoring of cumulative earnings on the TASIT were provided for those in the reward condition. It should be noted these visual aids were not always incorporated into the protocols of the aforementioned studies. However, given that patients with psychosis display aberrant reward processing that can be traced to impairments in anticipatory pleasure and neurocognitive abilities such as working memory deficits that might preclude maintenance of reward (Lewandowski et al., 2016), the use of multiple visual aids during the modified TASIT administration may have increased reward anticipation and reduced the neurocognitive load associated with representing rewards to maintain goal-directed behaviour.

For *effort*, a person must represent the perceived cost of the effort and determine an appropriate level of effort to exert based on the magnitude of the prospective reward. Participants in the reward condition were instructed that they could receive upwards of \$16 on the TASIT. Similarly, Summerfelt et al. (1991) presented participants with an initial reward of \$7.50, and indicated that correct or incorrect responses on the Wisconsin Card Sort Task could either earn or cost them money. Providing an initial monetary value may have assisted patients in establishing an effort-cost computation since the paradigms in the present study and Summerfelt et al. (1991) resulted in improved performance on social and non-social cognitive tasks, respectively. Unlike other study protocols that did not explicitly reveal any amount of potential earnings to participants, the current findings suggest that rewards must not only be salient, but also well-defined, to incentivize patients with psychosis to modulate the level of effort they exert on a social cognitive task.

Additional evidence that effort was relevant to the ToM performance of patients can be observed in the frequency of ‘don’t know’ responses between study conditions. While incorrect responses on the TASIT were never penalized, patients, but not controls, selected a greater frequency of ‘don’t know’ responses in the traditional administration where performance was not rewarded compared to patients in the condition where performance-contingent rewards were received. According to Sudman, Bradburn, and Schwarz (1996), responding to assessment questions can be a complex and effortful process that involves “interpreting the question, retrieving information, generating an opinion or a representation of the relevant behavior, formatting a response, and editing” (p. 57). Therefore, when assessments include a ‘don’t know’ response, Shoemaker, Eichholz, and Skewes (2002) proposed that selecting ‘don’t know’ can reflect lack of motivation, rather than lack of actual knowledge or opinion, due to the cognitive effort required to produce a response. In their study, Shoemaker et al. (2002) rated the cognitive effort of hundreds of questions from various national surveys, and demonstrated a positive association between the cognitive effort required to answer a question and the percentage of ‘don’t know’ responses it received. When these findings are applied to the present study, it can be hypothesized that, in the absence of any rewards, patients perceived the TASIT to be more effortful, which resulted in lower cognitive effort

exerted, as evidenced by the higher frequency of ‘don’t know’ responses in this study condition. In contrast, the availability of rewards may have reduced the perceived cognitive effort of the TASIT, and thereby reduced the frequency of ‘don’t know’ responses endorsed by patients in this condition. Nevertheless, the low base rate of ‘don’t know’ responses across participant groups and study conditions suggests that cognitive effort cannot solely explain overall performance differences on the TASIT.

Since the cost of effort is proportional to the magnitude of the reward, the ratio between effort and reward must also be considered. The TASIT was selected on the basis that it was among the lowest rated tasks of social cognition in a sample of patients with psychosis and matched controls, and took more than twice as long to administer as other tasks (Pinkham et al., 2015). Consequently, the low practicality and tolerability that was identified in the Pinkham et al. (2015) study underscores the higher perceived effort and low inherent reward of the TASIT, which may account for the lower performance exhibited by patients not exposed to rewards. The presence of a reward contingency may have yielded a significant modification to the effort-reward ratio, such that patients perceived the TASIT to be less effortful and more rewarding, and the combination of these factors may have led to improved task performance.

3.4.3 Corrective Feedback and Learning

Within the framework of effort-based decision-making, it can be inferred that the success of the experimental manipulation hinged on its ability to modify the effort-reward ratios of patients. Nevertheless, this framework relies on the assumption that ToM is largely a function of effort exerted during testing, and that amotivation undermines intact ToM abilities for patients with early psychosis. A distinct, yet related framework for interpreting the present findings is that monetary rewards were instrumental in enhancing ToM performance, but through a different mechanism; namely, implicit learning.

Rather than improving patients’ motivation to expend effort of intact knowledge during testing, the availability of monetary rewards may have helped to facilitate motivation for learning, whereby patients acquired an implicit understanding of the task rules. Because participants in the reward condition

were provided with corrective feedback following each social scenario on the TASIT, monetary rewards, in combination with this feedback, may have implicitly oriented patients to the relevant social stimuli which resulted in enhanced ToM skills. Indeed, extrinsic motivators have been shown to effectively motivate individuals with psychosis to achieve a range of learning goals that can generalize to improvements in clinical and functional domains (Silverstein et al., 2014), even for those with long-standing, treatment-refractory psychosis (Silverstein et al., 1998). Moreover, recent evidence highlights that implicit learning is preserved for individuals with psychotic disorders, who perform similarly to controls on tasks of implicit learning (Barch et al., 2017).

3.4.4 Performance Differences between Patients and Controls

It is evident that performance-contingent rewards and corrective feedback were features of the experimental manipulation involved, to varying degrees, in shaping the ToM performance of patients in the reward condition. However, these features did not seem to affect control participants since their ToM performance remained essentially unchanged between conditions.

Differences in reward processing may account for the divergent findings between participant groups, given that goal-directed behaviour is ultimately tied to the gratification or value derived from internal and external rewards. Intrinsic motivation refers to the internal drive to pursue novel experiences for interest or enjoyment, and behaviours that are intrinsically motivated are maintained even when external rewards are not present (Medalia & Saperstein, 2011). In contrast to patients with psychosis who display diminished intrinsic motivation across all stages of illness (Schlosser et al., 2014), extrinsic motivators could have had a limited impact on task engagement and persistence for control participants, who may have already been intrinsically motivated during testing. Moreover, self-competency beliefs are implicated in task motivation. Control participants, who were perhaps exposed to more frequent social contact than patients, could have been more familiar with the social scenarios similar to those on the TASIT, and held greater expectations of success, which further enhanced task motivation.

Responsivity to extrinsic rewards is also central to effort-based decision-making. The availability of extrinsic rewards does not necessarily induce extrinsic motivation, given the former refers to tangible incentives whereas the latter refers to behaviours executed to obtain tangible incentives (Silverstein, 2010). Even though patients and controls report similar subjective valuations of monetary rewards (Fervaha et al., 2013), it may be that patients, especially those in the early stages of psychosis, are more sensitive to monetary rewards in the context of social cognitive testing, where intrinsic motivation may be lower, relative to controls.

Reward processing and responsivity can explain performance differences within the framework of effort-based decision-making; however, patients and controls may have also responded differently to the corrective feedback. For instance, if patients had true impairments in ToM, it would be reasonable to conclude that implicit learning from the corrective feedback was responsible for the greater performance observed for patients in the reward vs. non-reward condition. Moreover, control participants performed in the normative range on the TASIT regardless of whether or not corrective feedback was available, which suggests this feedback did not provide added value for individuals who may have already possessed ToM skills.

3.4.5 Limitations and Future Research

The present study was subject to several limitations and considerations. While task motivation appeared to be higher for patients in the reward condition, the underlying mechanism by which it exerted this effect remains unknown. There are a confluence of factors that contribute to goal-directed behaviour, and isolating the specific components of reward valuation and effort allocation is needed to fully understand their relative effects on social cognitive performance for individuals with early psychosis. For instance, results from the present study provide evidence that patients exerted greater effort when the reward magnitude was increased; however, a growing body of research has found that patients consistently display a reduced willingness to choose high-effort alternatives, even when rewards are high and consistent (Gold, Waltz, & Frank, 2015). These latter findings suggest that individuals with psychosis

do not always approach tasks that are difficult and yield large rewards, but rather avoid tasks that are perceived to be too effortful, regardless of the magnitude of the reward available. One potential explanation for this response pattern is effort aversion, whereby patients experience a lower threshold for cognitively and/or physically demanding tasks relative to controls, and fail to modulate the level of effort they exert to achieve a goal once this threshold is met. Consequently, future research is warranted to determine the processes involved in reward valuation and effort allocation and their relationship with motivated behaviour, as it could be that patients overestimate the cost of effort, underestimate the reward value, and/or have difficulty translating these components into action in their daily life which may further perpetuate amotivation (Gold et al., 2015). Additionally, the experimental design does not allow for the determination of whether or how corrective feedback contributed to performance differences above and beyond monetary rewards, yet it is possible there was a combined effect of these factors given that monetary rewards alone have failed to produce changes in neurocognitive performance (Bellack et al., 1990; Green et al., 1992; Hellman et al., 1998).

Another limitation of the experimental design was that patients may have differed on other key variables that were not assessed in the present study. For instance, although a negative symptom dimension was derived from the BPRS, motivation was not directly assessed with a clinician-rated scale or behavioural measure, such as cognitive or physical effort tasks (Green et al., 2015). Reward responsiveness and defeatist performance beliefs are also associated with motivation and may have influenced ToM performance during testing, but were also not included in the assessment battery, and may be potential confounds worth exploring in future research (Culbreth, Moran, & Barch, 2018).

The durability of ToM performance is also unclear; future work should examine the degree to which these effects are maintained for patients once extrinsic motivators are withdrawn. Previous studies have reported inconsistent findings that either support (Penn & Combs, 2000) or question (Hellman et al., 1998) the durability of performance on tasks of social cognition or neurocognition one week after exposure to extrinsic motivators for patients with psychosis. Follow-up data could provide greater insight into the component of the experimental paradigm most responsible for performance differences between

conditions, since reductions in ToM performance over time would highlight the central role of monetary rewards, whereas stable ToM performance might suggest that learning occurred through corrective feedback. Even if improved ToM performance from extrinsic motivators showed longitudinal stability, the extent to which these motivators can influence related ToM tasks or other domains of social cognition, and whether performance gains can generalize to everyday functioning has yet to be explored, but represents an important future avenue of research.

Finally, neurobiological correlates may be relevant for future research, given that domains of neurocognition (e.g., working memory and cognitive flexibility) and components of reward processing (e.g., reward responsivity and learning) may share similar underlying mechanisms (Lewandowski et al., 2016). For instance, dopamine activity and brain regions, such as the anterior cingulate cortex, have been linked to both processes (Vassena et al., 2014). However, neural responses to social stimuli may be dependent on the reward type (social vs. monetary) and timing (anticipatory vs. consummatory), and it is still relatively unclear how these processes translate to behaviour (Fulford, Campellone, & Gard, 2018). Moreover, the few studies to examine the shared neurobiology of neurocognition and reward processing are limited to non-psychiatric samples, which suggests that neuroimaging may be a potential avenue to provide further understanding of the intersection between social cognition and motivation in psychosis.

3.4.6 Clinical Implications

There are several implications that can be drawn from the present results. First, it is often assumed that patients with psychosis are motivated to do well on laboratory-based assessments (Barch et al., 2008); however, suboptimal performance during social cognitive testing may be more indicative of motivational difficulties inherent to psychosis rather than true ToM impairments for patients in the early stages of illness. Still, there is limited support for this view, since neurocognitive difficulties have not been consistently ameliorated with monetary rewards (Bellack et al., 1990; Hellman et al., 1998; Summerfelt et al., 1991; Thornton et al., 2007), which may be partly due to the inconsistencies in previous study protocols. An important, but overlooked factor that may add to the understanding of

different outcomes across studies is duration of illness. Most of the previous research using extrinsic motivators sampled individuals with long-standing psychosis, whereas the present study exclusively recruited individuals in the early stages of illness. A hypothesis worthy of further investigation is whether ToM ability is relatively intact in early episode psychosis even if performance during traditional testing is lower due to motivational processes. With chronicity of illness and social withdrawal, it might become a true deficit over time. In keeping with this hypothesis, persistent social withdrawal would consequently limit opportunities to practice and refine social cognitive abilities, causing ToM ability to become degraded and less amenable to change as the illness progresses. Therefore, the severity of negative symptoms may be integral to whether or not ToM is utilized, and if left untreated, motivational difficulties could lead to prolonged impairment not only in the drive and desire for social interaction, but also ToM development (see Figure 3.3). Given the speculative nature of these predictions, future research should examine whether a distinct pattern of ToM performance emerges on the TASIT in a sample of patients with established psychosis exposed to monetary rewards and corrective feedback.

Second, it remains unclear the degree to which implicit learning contributed to the performance of patients in the reward condition, and additional studies could help disentangle this effect. If implicit learning was involved, the results suggest that specific components of ToM were responsive to learning, since patients were able to acquire the rules for detecting lies in social scenarios, but detecting sarcasm was less responsive to training. Within the TASIT, information revealed to the viewer at the beginning or end of each scene, either through camera angles or verbal statements, explicitly revealed the true state of events to one of the characters but not the other. However, unlike lies, which are ostensibly easier to detect, understanding sarcasm is a more complex cognitive process that requires the ability to accurately attend to subtle changes in social cues, such as paralinguistic features of communication, over the course of a communicative exchange (Mancuso et al., 2011). These cues may have not been as easily learned through implicit means on the TASIT, and may explain why performance on the lies, but not sarcasm, subscale differed between conditions for patients.

Building on this last point, future research may wish to confirm the specific components of ToM that are responsive to change with monetary rewards and corrective feedback, as these findings would have implications for training interventions that target social cognition. Additionally, implementing a similar experimental paradigm with alternative rewards may lead to different conclusions, given the inter- and intra-group variability in reward processing and responsivity, which could provide clinically relevant information to also help improve rehabilitative efforts.

3.4.7 Conclusions

In summary, amotivation is a prominent feature of psychosis that may undermine an individual's ability to put forth adequate effort during social cognitive testing. The combination of monetary rewards and corrective feedback appeared to have a marked influence on ToM performance for those in the early stages of illness, and resulted in a large effect size even after adjusting for intellectual ability and neurocognitive functioning. These results further highlight that motivational factors, such as reward valuation and effort allocation, are often underestimated in the context of social cognitive testing, where high perceived effort and low intrinsic reward may lead to ToM performance that does not reflect actual potential.

Therefore, given the established relationship between social cognition and functional disability in psychosis, identifying the illness-related developmental factors that contribute to social cognitive impairments remains a critical step in understanding and addressing the barriers to recovery. It is unlikely that the present experimental manipulation can lead to sustained improvements in ToM and associated functional impairment on its own. However, the development and integration of strategies that specifically target amotivation in social cognitive interventions may be a promising approach to help optimize treatment outcomes for patients in the early stages of illness.

Table 3.1. Demographic and Clinical Characteristics of Study Participants

Characteristic	Early Psychosis (<i>n</i> = 35)	Community Controls (<i>n</i> = 35)	Test statistic	<i>p</i> value	Partial η^2
Age	23.57 (5.08)	23.34 (4.61)	$F(1, 68) = .04$	.84	.001
Sex (<i>n</i> , % Male)	29 (82.9%)	25 (71.4%)	$\chi^2(1) = 1.3$	.26	
Ethnicity (<i>n</i> , % Caucasian)	29 (82.9%)	27 (77.1%)	$\chi^2(1) = .36$	.55	
Primary diagnosis (<i>n</i> , %)					
Non-affective psychosis	24 (68.6)				
Affective psychosis	11 (31.4)				
Antipsychotic medication (<i>n</i> , %)					
Typical	0 (0%)				
Atypical ^a	30 (85.7%)				
Unmedicated	1 (2.9%)				
Age at first hospitalization (years)	21.79 (5.17) [28]				
Age at program entry (years)	22.78 (5.24)				
Education (years)	12.66 (2.24)	14.31 (1.92)	$F(1, 68) = 11.06$	.001	.14
Independent living (<i>n</i> , %)	11 (31.4%)	30 (85.7%)	$\chi^2(1) = 21.25$	< .001	
Hollingshead current occupation level ^b	7.6 (1.31)	6.46 (2.32)	$F(1, 68) = 6.45$	.01	.09
Hollingshead highest occupation level ^b	6.09 (1.54)	5.17 (1.65)	$F(1, 68) = 5.73$	.02	.08
WRAT-3	-.04 (.78)	.49 (.57)	$F(1, 68) = 10.18$	.002	.13
SCIP total	-.76 (1.09)	.07 (.53)	$F(1, 68) = 16.27$	< .001	.19
BPRS symptom dimensions					
Manic–excitement	1.49 (.54)	1.13 (.15)	$F(1, 68) = 13.91$	< .001	.17
Negative	1.90 (.84)	1.05 (.16)	$F(1, 68) = 34.38$	< .001	.34
Positive	1.91 (1.12)	1 (0)	$F(1, 68) = 23.15$	< .001	.25
Depression–anxiety	3.07 (1.44)	1.57 (.55)	$F(1, 68) = 33.13$	< .001	.33
BPRS total	35.63 (10.01)	22.31 (2.84)	$F(1, 68) = 56.44$	< .001	.45
SDS	4.18 (2.27)	1.57 (1.19)	$F(1, 68) = 36.26$	< .001	.35

Note: Bolded values indicate $p < .05$. [*n*] denotes number of participants with available data. ^aThree individuals were taking more than one atypical antipsychotic medication. ^bSmaller values indicate higher occupational rankings. WRAT-3, Wide Range Achievement Test—Reading Recognition Subtest; SCIP, Screen for Cognitive Impairment in Psychiatry; BPRS, Brief Psychiatric Rating Scale; SDS, Sheehan Disability Scale.

Table 3.2. Demographic and Clinical Characteristics of Study Participants as a Function of Group and Condition Type

Characteristic	Early Psychosis			Community Controls		
	Non-reward (<i>n</i> = 18)	Reward (<i>n</i> = 17)	<i>p</i> value	Non-reward (<i>n</i> = 17)	Reward (<i>n</i> = 18)	<i>p</i> value
Age	23.22 (4.14)	23.94 (6.03)	.68	24.12 (5.4)	22.61 (3.73)	.34
Sex (<i>n</i> , % Male)	15 (83.3%)	14 (82.4%)	.94	12 (70.6%)	13 (72.2%)	.92
Ethnicity (<i>n</i> , % Caucasian)	16 (88.9%)	13 (76.5%)	.33	15 (88.2%)	12 (66.7%)	.13
Primary diagnosis (<i>n</i> , %)						
Non-affective psychosis	14 (77.8%)	10 (58.8%)	.23			
Affective psychosis	4 (22.2%)	7 (41.2%)				
Antipsychotic medication (<i>n</i> , %)						
Typical	0	0				
Atypical ^a	18 (100%)	12 (70.6%)	.23			
Unmedicated	0 (0%)	1 (5.9%)				
Age at first hospitalization (years)	20.71 (4.16)	22.86 (5.99)	.28			
	[14]	[14]				
Age at program entry (years)	21.93 (4.05)	23.69 (6.27)	.33			
Education (years)	12.39 (1.58)	12.94 (2.79)	.47	13.71 (1.83)	14.89 (1.88)	.07
Independent living (<i>n</i> , %)	4 (22.2%)	7 (41.2%)	.23	16 (94.1%)	14 (77.8%)	.17
Hollingshead current occupation level ^b	7.67 (1.19)	7.53 (1.46)	.76	6.47 (2.5)	6.44 (2.2)	.97
Hollingshead highest occupation level ^b	6.28 (1.36)	5.88 (1.73)	.46	5 (1.62)	5.33 (1.72)	.56
WRAT-3	-.19 (.83)	.12 (.73)	.26	.43 (.62)	.54 (.53)	.56
SCIP total	-.91 (1.1)	-.6 (1.1)	.41	.13 (.55)	.02 (.53)	.55
BPRS symptom dimensions						
Manic–excitement	1.67 (.67)	1.29 (.27)	.04	1.13 (.16)	1.13 (.15)	.94
Negative	2.11 (.98)	1.67 (.61)	.12	1.04 (.16)	1.06 (.17)	.77
Positive	2.19 (1.18)	1.63 (1.02)	.15	1 (0)	1 (0)	
Depression–anxiety	2.8 (1.33)	3.35 (1.53)	.26	1.61 (.66)	1.54 (.43)	.71
BPRS total	37.11 (11.55)	34.06 (8.34)	.38	22.29 (3.69)	22.33 (1.81)	.97
SDS	3.94 (1.93)	4.43 (2.63)	.53	1.45 (1.24)	1.68 (1.16)	.57

Note: Bolded values indicate $p < .05$. [*n*] denotes number of participants with available data. ^aThree individuals were taking more than one atypical antipsychotic medication. ^bSmaller values indicate higher occupational rankings. WRAT-3, Wide Range Achievement Test—Reading Recognition Subtest; SCIP, Screen for Cognitive Impairment in Psychiatry; BPRS, Brief Psychiatric Rating Scale; SDS, Sheehan Disability Scale.

Table 3.3. Partial Correlations between TASIT Total Scores and Clinical Characteristics of Study Participants while adjusting for Condition Type (Reward vs. Non-Reward)

Characteristic	TASIT total			
	Early Psychosis (<i>n</i> = 34)		Community Controls (<i>n</i> = 35)	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
WRAT-3	.50	.003	.39	.02
SCIP total	.25	.16	.37	.03
BPRS symptom dimensions				
Manic–excitement	-.01	.94	.33	.06
Negative	-.32	.07	-.16	.37
Positive	.09	.63		
Depression–anxiety	.13	.46	.10	.57
BPRS total	-.02	.92	.08	.65
SDS	-.11	.54	-.13	.47
Self-perceptions of social cognition	.35	.05	.19	.28

Note: Bolded values indicate $p < .05$. WRAT-3, Wide Range Achievement Test—Reading Recognition Subtest; SCIP, Screen for Cognitive Impairment in Psychiatry; BPRS, Brief Psychiatric Rating Scale; SDS, Sheehan Disability Scale.

Table 3.4. Means and Standard Errors for TASIT Measures as a function of Group and Condition Type after controlling for Estimated Premorbid Intelligence and Global Neurocognition

Measure	Early Psychosis		Community Controls	
	Non-reward (<i>n</i> = 17)	Reward (<i>n</i> = 17)	Non-reward (<i>n</i> = 17)	Reward (<i>n</i> = 18)
TASIT total (z-scores)	-1.33 (.22)	-.4 (.21)	.22 (.21)	.01 (.21)
Lies	-1.26 (.27)	-.46 (.26)	-.1 (.26)	-.5 (.25)
Sarcasm	-.87 (.21)	-.2 (.2)	.39 (.2)	.42 (.2)
'Don't know' responses (<i>n</i>)	1.85 (.32)	.04 (.31)	.32 (.31)	.03 (.3)

Figure 3.1. Group by Condition Interaction Effect for TASIT Total Scores

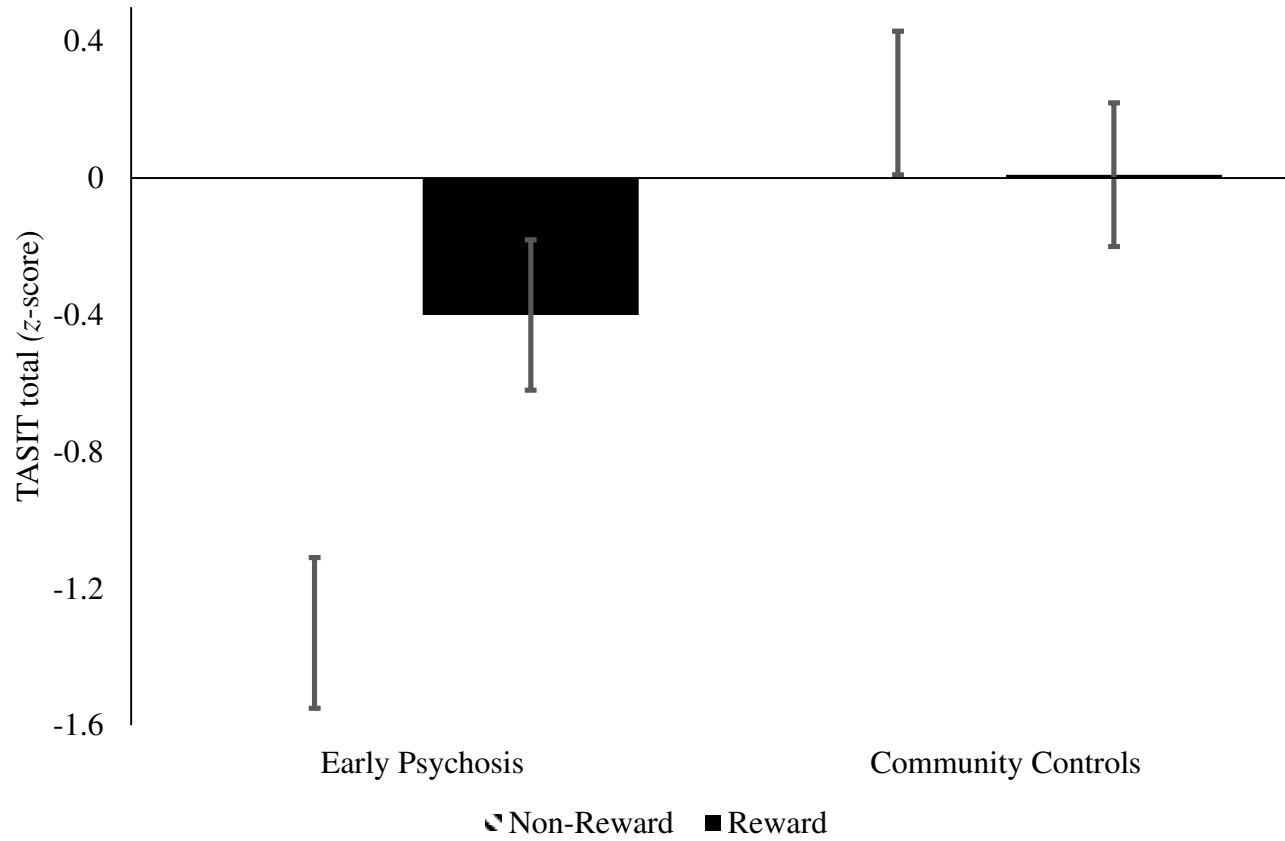


Figure 3.2. Group by Condition Interaction Effect for ‘Don’t Know’ Responses

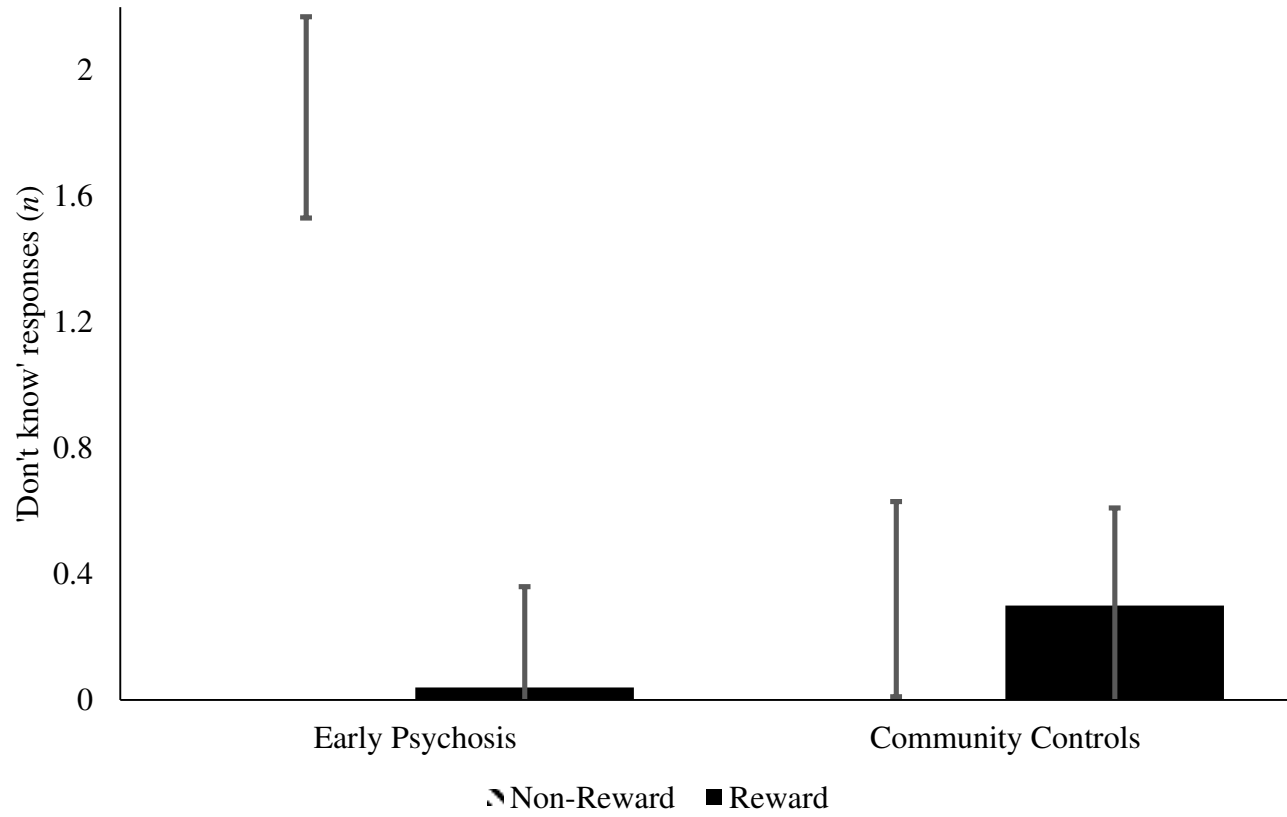
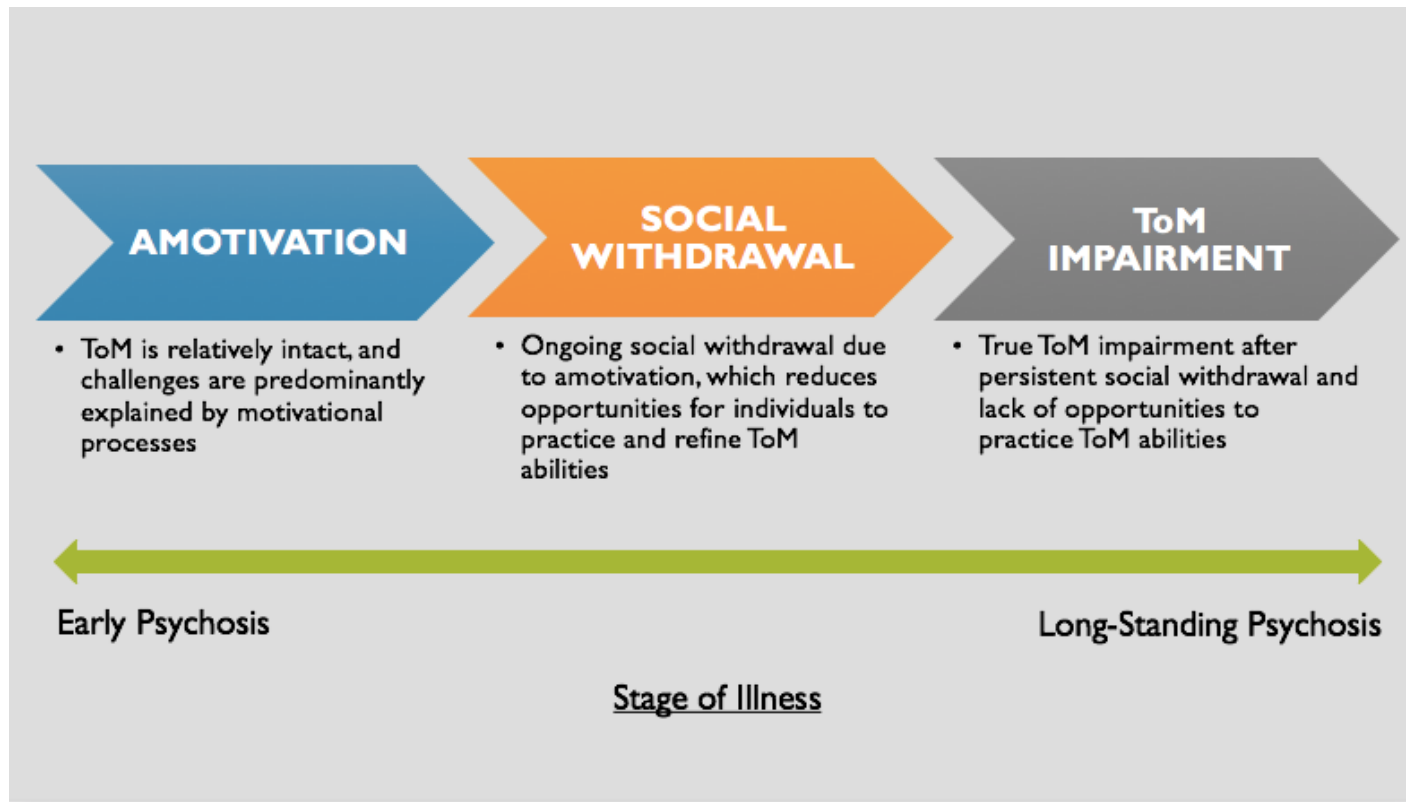


Figure 3.3. Proposed Progression of ToM Abilities Across Stages of Psychotic Illness



Chapter 4

General Discussion

4.1 Summary of Study Goals and Research Findings

A first episode of psychosis often occurs in young adulthood during a developmental period that is critical for identity formation, relationship building, and vocational growth. Declines in various domains of functioning are detected before the onset of overt psychotic symptoms (Addington et al., 2011; Carrión et al., 2013) and become comparatively worse once symptoms fully manifest and if the duration of untreated psychosis increases (Marshall et al., 2005). Even with timely antipsychotic treatment and remission of positive symptoms, complete recovery remains an elusive goal since only approximately one-third of patients achieve full symptomatic and functional remission following a first episode of illness (Lally et al., 2017). Therefore, the early stages of psychosis represent a period that is characterized by major disruptions to daily life, which can have a deleterious effect on the long-term outcomes of individuals.

Identifying and treating the factors that are most closely tied to everyday behaviours are necessary for improving the clinical and functional status of patients, especially those who stand to benefit most from early intervention. Among the factors that have been studied thus far, social cognition represents the strongest and most consistent determinant of everyday functioning (Schmidt et al., 2011), and has become a prime therapeutic target to improve functional outcomes and thereby increase the potential for full recovery (Horan & Green, 2017). Despite a large body of research documenting the magnitude of impairment across domains of social cognition and stages of illness, there are significant gaps in the existing literature base; namely, a lack of understanding as to *why* patients display these profound impairments and the specific factors that contribute to their maintenance.

Two illness-related factors, cognitive biases and motivational deficits, were hypothesized to be implicated in the social cognitive performance of patients with an emerging psychotic illness. These

factors were selected on the basis that tasks commonly used to assess social cognition fail to account for cognitive and motivational resources involved in processing social information since most of these tasks were initially developed to assess non-psychotic populations (Dodell-Feder et al., 2013). More specifically, cognitive biases, such as JTC, and amotivation reflect clinical features of psychosis that were anticipated to influence the manner in which patients approach tasks of social cognition, and potentially identify processes that give rise to impairments.

The present studies were undertaken to examine these factors by experimentally manipulating two video-based tasks of social cognition that portray naturalistic social scenarios and more closely resemble real-world interactions compared to other measures of social cognition. In Chapter 2, a modified task of social perception and knowledge was administered to assess whether two cognitive biases common to psychosis, JTC and BADE, were relevant to processing social information. Early psychosis patients displayed a higher propensity to JTC on a task of social perception and knowledge than a group of community controls, as defined by the presence of premature and uniformed social judgments. Participants who exhibited this early response pattern, regardless of group, displayed significantly poorer overall task accuracy. A BADE was defined as the reduced flexibility of social judgments over time. This response pattern was not evident for patients on the task since they were able to update their premature and uniformed social judgments at a rate that was comparable to controls. In Chapter 3, a task of ToM was presented to early psychosis patients, who were randomized to either receive monetary reinforcement and corrective feedback or a standard administration of the task. Community controls were similarly randomized to one of these two study conditions. Compared to control participants who did not differ in ToM performance between conditions, early psychosis patients who received performance-contingent incentives displayed ToM performance that differed both statistically and clinically relative to patients who did not receive performance-contingent incentives. Results from this study suggested that social cognitive performance may underrepresent actual abilities due to motivational deficits in the early stages of psychosis. Further support for this interpretation was observed from the differential use of the ‘don’t know’ response option, a measure hypothesized to be a proxy of effort, between the study conditions for

patients. Control participants infrequently selected this response option regardless of whether or not performance-contingent incentives were available; however, there were discrepancies in the number of ‘don’t know’ responses selected by patients between conditions on the task, such that they endorsed this response significantly less if rewards were available. Accordingly, patients in the early stages of psychosis appeared to modulate their level of effort during social cognitive testing, which had direct consequences for performance.

Using experimental approaches, the present studies provide insight into a specific cognitive bias involved in processing social information, and the role of effort during testing, both of which were directly associated with outcomes on tasks of social cognition for patients with early psychosis. Importantly, these studies add to the growing literature on social cognitive performance among individuals in the early stages of illness, and allow for performance to be characterized among patients within a discrete illness phase, rather than combining patient groups across the course of illness, which can provide important insight into the disease process.

4.2 Theoretical Implications

Even with increased efforts to measure social cognitive performance in discrete phases of illness, a comprehensive theoretical framework to explain the processes that lead to impairments in psychosis is still lacking. Part of the challenge in establishing a well-defined framework is the inconsistent factor structure underlying social cognition. Domains of social cognition were originally hypothesized to be distinct constructs (Green et al., 2008), but have since been shown to be overlapping (Lysaker et al., 2013) or hierarchical in nature (Mancuso et al., 2011), which makes it difficult to confirm a precise structure that would allow for the development of a unified framework. For instance, a study by Mancuso et al. (2011) demonstrated that measures of attributional style loaded onto a unique factor that was relatively distinct from others in that it correlated with clinical symptoms, but not functional outcomes, in a sample of schizophrenia patients.

Another challenge with clarifying the theoretical underpinnings of social cognition is the limited longitudinal research on this topic. Until recently, much of the literature on social cognition attempted to describe the performance of patients across domains and phases of illness using cross-sectional data. One of the first long-term investigations of social cognition was conducted by Horan et al. (2011), who examined performance on three key domains over a 12-month period in the prodromal, first episode, and chronic phases of psychosis. The authors concluded that emotion perception, ToM, and social perception and knowledge remained unchanged in all three groups. Similar findings have since been reported for longer-term follow-up periods. Early psychosis patients displayed no difference in ToM performance after three years (Ayesa-Arriola et al., 2016), and chronic psychosis patients displayed no difference in performance on tasks of emotion perception and social perception and knowledge after five years (McCleery et al., 2016), highlighting the trait-like stability of social cognitive domains in early and chronic psychosis. These results, taken together with studies reporting that difficulties in social cognition are evident in remitted patients (Bora, Gökçen, Kayahan, & Veznedaroglu, 2008), strengthen the hypothesis that, similar to neurocognition, impairment in social cognition appears before the onset of clinical symptoms and persists throughout the different phases of illness.

At first glance, data from the present studies appear to support this perspective, given that performance on a modified version of the IPT-15 for early psychosis patients was comparable to that of patients with long-standing illness who were administered the original version of the task in a study by Vaskinn et al. (2009). Additionally, early psychosis patients who were randomized to receive a standard administration of the TASIT performed similarly to two independent samples of chronic patients who completed the same measure (e.g., Green et al., 2011; Pinkham et al., 2015). Despite strong evidence in favour of the stability of social cognition, not all studies have found that performance is compromised in the prodromal stage of illness (Couture et al., 2008) or in remitted patients after their first episode of psychosis (Caldiroli, Buoli, Serati, Cahn, & Altamura, 2016). In fact, a recent study reported that early psychosis patients displayed performance on the TASIT that was more in line with control participants than patients with long-standing psychosis (Ludwig, Pinkham, Harvey, Kelsven, & Penn, et al., 2017),

and a prospective study highlighted no differences between first episode patients and healthy controls on a measure of social cognition at a four-year follow-up period (Kenney et al., 2015). There are also data to suggest that antipsychotic medication can improve ToM performance (Savina & Beninger, 2007), which brings into question whether specific medications may play a role in protecting further deterioration of social cognition and/or exacerbating existing impairment in psychotic disorders.

The methodological limitations of previous studies and lack of longitudinal data preclude any firm conclusions about whether social cognitive abilities fit the pattern of a stable, vulnerability indicator or a marker of disease progression (Pousa, David, & Ruiz, 2008). Furthermore, the diverse assessment and sampling methods across studies make it a challenge to establish a consistent model of how social cognitive impairments arise and the factors that maintain these impairments over time. From the cross-sectional data available, a model that has been widely accepted on theoretical grounds is that neurocognition serves as a robust predictor of social cognition, which, in turn, affects functional outcomes (Fett et al., 2011). In recent years, amotivation has been included in this model, since it has shown to indirectly affect neurocognitive performance through effort (Foussias et al., 2015), and to also mediate the relationship between social cognition and functioning (Gard et al., 2009). The findings from Chapter 3 add to the existing literature by demonstrating that amotivation appears at another point in this model; namely that it shows a direct influence on social cognitive performance. Additionally, while cognitive biases were previously unexplored in the context of this model, the findings from Chapter 2 highlight the relevance of JTC to social cognitive performance.

Given the experimental nature of the present studies, the findings reported, while preliminary, have implications for understanding the directionality of these effects, and refining the theoretical framework for social cognition in psychotic disorders, which has been primarily constructed by cross-sectional rather than longitudinal or experimental studies. As described in Chapter 3, a consideration in need of further investigation is whether the early stages of psychosis may be a period during which social cognitive performance is relatively intact, but other features of the illness contribute to the notable impairments observed. In keeping with this hypothesis, it could be argued that cognitive and/or

motivational processes may initially account for poor social cognitive performance, but that social cognitive abilities become truly impaired over time due to persistent social withdrawal and greater illness chronicity. Other researchers have similarly begun to question the extent to which factors independent of social cognition play a direct role in the course of impairments. For instance, Catalano, Heerey, and Gold (2018) recently postulated that reduced social reward valuation early on in the illness may impede social cognitive development by limiting patients' degree of exposure to social activities. Although speculative, this statement, along with mixed evidence regarding the trait-like nature of social cognition in psychosis, suggests that much more work is needed in this area to understand what contributes to and maintains these impairments. Therefore, longitudinal studies that incorporate multiple illness-related factors and follow-up time points will be necessary to determine whether social cognitive abilities and/or the factors that influence performance are core, stable impairments or developmental features of the illness that progressively worsen over time.

4.3 Clinical Implications

A more complete understanding of the complex relationships between illness-related factors and social cognition is also important for the field to build empirically-driven approaches to optimize functional outcomes for patients. As it currently stands, there are a number of psychosocial interventions that have been created to enhance social cognition, with the goal that skills acquired during training will ultimately generalize to everyday functioning. Although the earliest forms of social cognitive interventions were embedded in “broader-based” treatments that also targeted neurocognition and social competence, more “targeted” treatments emerged during the past few decades that focused on a single domain of social cognition. The efficacy of these small, proof-of-concept studies set the stage for a new wave of “comprehensive” social cognitive treatments (Horan & Green, 2017). These newer, more intensive interventions were established to target two or more domains of social cognition using manualized, group-based approaches, but significantly vary in terms of the treatment modality, content, duration, intensity, and outcome measures.

A recent meta-analysis by Kurtz, Gagen, Rocha, Machado, and Penn (2016) identified that seven comprehensive training programs of social cognition have been evaluated in a total of 16 studies to date, and differential outcomes were found depending on the domain of social cognition targeted. Collectively, results from this meta-analysis demonstrated that social cognitive training programs had the largest effects on emotion recognition ($d = .84$), followed by moderate effects on ToM ($d = .70$), and small to medium effects on attributional styles ($ds = .30-.52$). However, in a commentary on the current state of social cognitive interventions, Horan and Green (2017) highlighted the shortcomings of the literature, and specifically drew attention to the limited methodological rigor of the data reported thus far. The authors concluded that improvements from social cognitive interventions appear more directly linked to the outcome measures employed, and that “cautious optimism” regarding the treatment effect sizes is warranted given the “number and seriousness of limitations of prior work” (Horan & Green, 2017, p. 7).

Several lines of research may be important to consider as the field strives to enhance the efficacy and generalizability of social cognitive interventions, which are still in their infancy. In addition to using outcome measures with stronger psychometric properties, the durability of treatment effects and their transfer to real-world outcomes are not fully understood, and remain important areas of future research. However, perhaps an even greater priority is to establish the active ingredients of social cognitive interventions, given the range of approaches that exist and the absence of knowledge regarding the specific content that facilitates change in social cognition (Kurtz et al., 2016). While many training components are common to the seven comprehensive programs reported by Kurtz et al. (2016), none appear consistent across all programs and necessary for improved performance. Indeed, the intervention methods that have been outlined include a combination of psychoeducation, drill-and-practice exercises, strategy games, and/or role-plays, with variability in treatment length (2.5 to 6 months), frequency of contact (1 or 2 times per week), and number and type of social cognitive domains targeted (Horan & Green, 2017).

The use of experimental research designs is a critical step to identify the essential components of social cognitive interventions, and findings from the present research shed light on illness-related factors

other than pure social cognitive abilities that may be useful targets to improve the efficacy of existing treatments. For instance, some interventions, such as Social Cognition and Interaction Training (Penn et al., 2007) and Metacognitive Training (Moritz & Woodward, 2007), have addressed cognitive biases in their training by drawing patients' awareness to JTC and its relationship to social judgments and outcomes. If additional research supports the relevance of JTC to other social cognitive tasks and domains, it may be an important training component that should be broadly incorporated into other programs. Moreover, the lack of evidence for a BADE response pattern in the context of a social cognitive task suggests that early psychosis patients displayed an intact ability to update faulty social judgements. This finding provides further justification for the role of social cognitive training, given that early and uninformed social judgments appear to be amenable to change, at least within the first few years following illness onset.

Motivation is another factor that is likely implicated in social cognitive performance, since ToM impairments were seemingly eliminated in a sample of early psychosis patients who received performance-contingent incentives compared to those who did not. One explanation is that low motivation during social cognitive testing arises, in part, because of impairments in effort-based decision-making. It still remains unclear whether such impairments are attributed to an overestimation of the cost of effort, underestimation of the reward value, and/or difficulty in translating these components into motivated behaviour (Gold et al., 2015). However, there is emerging research to suggest that individuals with schizophrenia undervalue social but not monetary rewards relative to healthy controls (Catalano et al., 2018). This lower reward responsivity to social stimuli may undermine engagement during social cognitive training programs, which could limit the transfer of skills to real-world behaviours and impede functional recovery. Future research will be needed to explore this possibility.

Other factors are hypothesized to contribute to effort-based decision-making in psychosis, such as anticipatory pleasure, defeatist performance beliefs, and higher-order cognitive functions involved in representing effort-reward information (Culbreth et al, 2018). These factors and their relationship to social cognition and functional outcomes are still not well understood, but may have important

implications for effort allocation and performance in these contexts. Given that social cognitive training programs narrowly focus on instructional techniques and skill-building, a potential approach to enhance effort within such programs may involve addressing defeatist beliefs if they are found to play a key role in social cognitive performance. For instance, incorporating elements of cognitive behavioural therapy may be helpful to address maladaptive thinking patterns and assist patients in building mastery in testing and training environments, as these approaches have been successfully applied to cognitive remediation (Bowie & Gupta, 2016) and vocational rehabilitation programs (Mervis et al., 2017).

Attempts to directly enhance intrinsic motivation may also improve social cognitive interventions. Medalia and Saperstein (2011) proposed that outcomes of psychosocial treatments hinge on intrinsic motivation, which is integral to task engagement and learning potential. Moreover, intrinsic motivation may be low in training environments that do not explicitly “(1) provide opportunities to personalize tasks (personalization), (2) make the value more obvious by placing tasks within a context that links the learning task to everyday life (contextualization), and (3) promote autonomy by providing opportunities to control aspects of the learning activity” (Medalia & Saperstein, 2011, S124).

In keeping with these recommended components of training environments, Fiszdon, Kurtz, Choi, Bell, and Martino (2015) adapted motivational interviewing to individuals with psychotic disorders prior to a cognitive remediation program. This two-session, adjunctive intervention focused on promoting agency and behavioural change in patients, and ultimately led to increased intrinsic motivation during treatment and greater total session attendance. Additionally, a novel internet-based social cognitive program, SocialVille, was recently developed to increase autonomy and personalization by allowing users to remotely engage in training, and presenting a range of nearly 30 activities that can be adaptively tailored to patients’ abilities with minimal supervision. Treatment outcomes from this intervention are currently being evaluated in a large, multi-site randomized controlled trial (Rose et al., 2015); however, these few studies highlight the utility of assessing and enhancing patient motivation in training environments, which may consequently contribute to better treatment engagement and rehabilitation outcomes.

Although psychosocial interventions have shown initial promise in improving social cognitive impairments in psychosis, there is still a long way to go before widespread efforts to disseminate these interventions are justified (Horan & Green, 2017). A greater understanding of illness-related factors that maintain social cognitive impairment can assist in developing approaches to maximize the efficacy and generalizability of interventions that target social cognition, across all domains of social cognition and stages of illness for patients with schizophrenia spectrum disorders. Furthermore, the study of social cognition in psychosis has the potential to not only advance our understanding of the illness and its course, but to also improve the functional outcomes of patients and assist them in achieving their long-term recovery goals.

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Appendix A

Research Ethics Board Approval



QUEEN'S UNIVERSITY HEALTH SCIENCES & AFFILIATED TEACHING HOSPITALS RESEARCH ETHICS BOARD (HSREB)

HSREB Renewal of Ethics Clearance

February 15, 2017

Mr. Michael Grossman
Department of Psychology
Queen's University

ROMEO/TRAQ #: 6017913
Department Code: PSYC-174-16
Study Title: Mechanisms of Social Cognition in Early Episode Psychosis
Review Type: Delegated
Date Ethics Clearance Effective: March 15, 2017
Ethics Clearance Expiry Date: March 15, 2018

Dear Mr. Grossman,

The Queen's University Health Sciences & Affiliated Teaching Hospitals Research Ethics Board (HSREB) has reviewed the application. This study, including all currently approved documentation has been granted ethical clearance until the expiry date noted above.

Prior to the expiration of your ethics clearance, you will be reminded to submit your renewal report through ROMEO. Any lapses in ethical clearance will be documented below.

Yours sincerely,

Albert J. Clark
Chair, Health Sciences Research Ethics Board

The HSREB operates in compliance with, and is constituted in accordance with, the requirements of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations, Canadian General Standards Board, and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is qualified through the CTO REB Qualification Program and is registered with the U.S. Department of Health and Human Services (DHHS) Office for Human Research Protection (OHRP). Federalwide Assurance Number: FWA#:00004184, IRB#:00001173

HSREB members involved in the research project do not participate in the review, discussion, or decision.