A MODEL ON EVALUATION OF SOCIAL COGNITION

FOR PERSONS WITH SCHIZOPHRENIA IN A CHINESE POPULATION

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A Model on Evaluation of Social Cognition for Persons with Schizophrenia in a Chinese Population

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CERTIFICATE OF ORIGINALITY

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it reproduces no material previously published or written, nor material that has been accepted for the award of any other degree or diploma, except where due acknowledgement has been made in the text.

_____(Signed)

_____(Lo Man Ting)

DEDICATION

I would like to dedicate this thesis to my grandmother for her love, endless support, for being my role model, and for making me to become who I am today.

Abstract of dissertation entitled: ***A Model on Evaluation of Social Cognition for Persons with Schizophrenia in a Chinese Population*****, by Lo Man Ting for the degree of Master of Philosophy at The Hong Kong Polytechnic University in Dec 2016.**

ABSTRACT

Introduction

Social cognition is a complex construct, encompassing several social cognitive processes, including emotion perception, theory-of-mind, attributional style and jump-to-conclusion tendency. There is growing evidence showing that social cognition could contribute to work performance and outcomes in persons with schizophrenia. Current studies on social cognition is limited by a lack of consensus on the conceptualization of social cognition, and the lack of assessments that could provide a comprehensive evaluation of key social cognitive processes. The present study consisted of two stages. Stage I is a validation study of two social cognitive assessments, the Chinese-Facial Emotion Identification Test (C-FEIT) and the Chinese-Social Cognition and Screening Test (C-SCSQ). This thesis proposed to use the two instruments to form a comprehensive social cognition assessment battery. Stage II study examined how far social cognition, neurocognition and clinical symptoms could predict longitudinal work outcomes.

Method

In Stage I, a group of expert panel was formed to evaluate the content-related validity of C-SCSQ after translation of SCSQ. A sample of 30 outpatients with schizophrenia were recruited using convenience sampling to collect data for evaluating the test-retest

reliability of C-FEIT and C-SCSQ. The predictive validity of C-FEIT and C-SCSQ on work performance measure was investigated. Known group validity was examined by examining if the social cognitive assessment battery could differentiate the performance between matched samples of patient and controls. In Stage II study, measures of social cognition, neurocognition and clinical symptoms were obtained from a sample of 62 outpatients with schizophrenia. The subjects were followed up at 3-months and 6-months to collect indexes of their longitudinal work outcomes. Correlational analyses and logistic regression were performed to examine associations between variables on job tenure/salary and to identify significant predictors on employment status.

Result

The C-SCSQ demonstrated good content-related validity and both C-FEIT and C-SCSQ possessed good test-retest reliability. For known group validity, the control group had significantly better performance in C-SCSQ (d ranges from 1.26 to 3.27) and C-FEIT (d = .56) than the patient group. A structural equation model with satisfactory model fit (CFI = .91, RMSEA = .12) was constructed, which showed that social cognition had a significant impact on work performance. This provides support to the predictive validity of the assessment battery.

For stage II study, the "neurocognitive" factor (comprising neurocognitive measures and emotion perception) significantly predicted the employment status at 3 months. The social cognitive factor (comprising theory-of-mind, attributional style and jump-to-conclusion) did not predict the employment status.

Conclusion

This study showed that the assessment battery comprising of C-FEIT and C-SCSQ possessed acceptable to good reliability and validity. This supports its application in measurement of social cognition of persons with schizophrenia in Chinese population. The study result suggested social cognition construct, as a whole, had a significant impact on work performance. However, only emotion perception and neurocognition, but not key social cognitive abilities, predict prospective employment status.

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Chapter I

INTRODUCTION

1.1 Overview

This chapter provides an overview of the theoretical background of this study. It outlines the current theoretical model on social cognitive processes, which how social cognitive processes are linked to functional outcomes in schizophrenia. It begins with an outline of the statement of purpose, followed by the background and justification of the study, and ends with an outline of the organization of the thesis.

1.2 Statement of purpose

Schizophrenia is a severe psychiatric illness characterized by marked deficits in a wide array of functional areas including independent living, social and work functioning (Dickerson, Bellack & Gold, 1997; Jaeger, Berns & Czobor, 2003; Wallace, 1986). Among these functional areas, work is regarded as one of the most important dimensions of recovery. Neurocognition (including attention, memory, and executive functioning) has long been regarded as the most important predictor of work performance and competitive work status (Bell & Bryson, 2001; Green, 1996; Velligan, Bow-Thomas, Mahurin Roderick, Miller & Halgunseth, 2000). However, several recent meta-analyses revealed that neurocognition only account for a small but significant (6%) variation in community functioning. This indicates that apart from neurocognition, there

are other individual factors that contribute to functional outcome in persons with schizophrenia. Social cognition has been receiving more and more research attention as a mediator between neurocognition and functional outcomes (Schmidt, Mueller & Roder, 2011), and as a valid predictor of adjustment outcome that could not be accounted for or by neurocognition alone (Fett, Viechtbauer, Penn & van Os, 2011; Pijenborg et al., 2009). There is increasing evidence that social cognition could impact on the work performance and employment outcomes in persons with schizophrenia.

Social cognition is defined as the mental operation that underlies social interactions, including perceiving, interpreting, and responding to the intentions, dispositions, and behaviors of others (Fiske & Taylor, 1991). Social cognition is a multi-faceted construct, encompassing several mental processes including emotion perception, theory-of-mind, attributional style (Green et al., 2008). Persons with schizophrenia could have deficits or bias or both in these social cognitive processes. Such deficits could include difficulties in recognizing others' emotions and in understanding others' thoughts, and social cognitive bias mainly refers to attribution biases. These social cognitive deficits and bias could greatly limit persons with schizophrenia in establishing effective social relationship with co-workers or employers. Current work rehabilitation incorporates re-training of social skills and remediating of neurocognitive functioning, alongside with work rehabilitation options such as supported employment, to promote work outcomes (Kurtz, Mueser, Thime, Corbera & Wexler et al., 2015). Social cognition could be an important assessment and treatment target in the future work rehabilitation to facilitate the return to work or maintenance of jobs among persons with schizophrenia.

There are several research gaps in current measurement and study of social cognition, and there were very few studies that are conducted among Chinese populations. First, there is a lack of consensus on the conceptualization and definition of social cognition, and how it is related to neurocognition and community functioning of persons with schizophrenia. Second, there is a lack of standardized tools for assessing different social cognitive processes. There are concerns that many common social cognitive assessment tools possessed only fair reliability and validity, or unable to cover all the key social cognitive domains, such as emotion perception, attributional style and jump-to-conclusion bias. Third, the complex nature of social cognition also creates difficulty for clinicians or researchers to conduct a comprehensive evaluation within a reasonable time. Last, there is much evidence that cultural influence impact on social cognitive performance, such as in emotion recognition (Biehl et al., 1997; Elfenbein & Ambady, 2002) and in theory of mind (Zhu et al., 2007). There is a need to adapt and validate translated instruments for use with Chinese populations, as most of the current measurement tools are mainly developed in Western culture.

In sum, it is of research and clinical interest to develop a culturally relevant social cognition assessment tool that could be completed within a reasonable timeframe. The assessment tool needs to be able to assess the key social cognitive deficit among Chinese schizophrenia patients and for outcome evaluation after social cognitive rehabilitation. Furthermore, it is worth studying the role of social cognition in work performance of persons with schizophrenia in the community. The current study aims to validate a social cognitive assessment battery consisting of two standardized instruments, and together they assess four key social cognitive processes. The validated instruments

are then used to explore the relationship between these social cognitive processes with longitudinal work outcomes.

1.3 Organization of chapters

This thesis has six chapters. The current chapter is the Introduction. Chapter two summarizes the literature review on schizophrenia, key social cognitive processes that represent the construct of social cognition and the issues of current social cognition assessments. A conceptual framework on evaluation of social cognition is proposed. This chapter ends with presenting the justifications of the study. Chapter Three describes Stage I of the study. It presents the methodology and results of the validation study of two social cognitive assessments, i.e. the Chinese Facial Emotion Identification Test and the Chinese Social Cognition and Screening Questionnaire. Chapter Four presents the methodology and results of stage II study. Stage II study investigated how far social cognition, neurocognition and clinical variables may be linked to longitudinal work outcomes. Chapter Five discusses the results of stage I and stage II study. It starts with the discussion on significance of study, follows by study implications and ends with describing the study limitations. Chapter Six provides a concluding remark of the thesis.

Chapter II

LITERATURE REVIEW

2.1 Overview

This chapter presents a critical review of current literature on social cognition, follows by the description of conceptual model for study and operational definitions of key variables. The first part of this chapter reviews the four common social cognitive processes observed in schizophrenia, measurement issues of social cognition in Chinese samples and current evidence on the relationships between social cognitive processes and work in schizophrenia. It then describes a proposed conceptual framework on evaluation of social cognition and presents a case illustration of social cognitive processes in a work-related social situation, and it ends with the research gap and the aims/objectives of stage I and stage II study.

2.2 Work performance and employment outcomes in persons with schizophrenia

Schizophrenia is a serious mental disorder that affects how a person thinks, feels, and behaves. As specified in the Diagnostic and Statistical Manual of Mental Disorders – fifth version (DSM-5), the diagnostic criteria of schizophrenia included: 1) Presentation of at least two Criterion A symptoms (delusion, hallucination, disorganized speech, grossly disorganized or catatonic behavior, negative symptoms) for a significant portion of time during a period of one month or longer, 2) Impairment in one or more major

areas of functioning (Criterion B), 3) Some signs of the disturbance must persist for a continuous period of at least 6 months (Criterion C), 4) Rule out diagnoses of schizoaffective disorder and depressive or bipolar disorder with psychotic features (Criterion D), 5) Rule out disturbance attributed to the physiological effects of a substance (Criterion E) (APA, 2013). The lifetime prevalence rates schizophrenia ranges from 0.3% to 0.7% around the world (APA, 2013). The point prevalence of schizophrenia is about 5 per 1000 and the incidence of schizophrenia is about 0.20 per 1000 per year (APA, 2006).

Although schizophrenia has a relatively low prevalence rate compared with common mental disorders, it is one of the most disabling mental disorder. Schizophrenia is a severe psychiatric illness characterized by marked deficits in a wide array of functional areas, and together with schizoaffective disorder, it is the fifth leading cause of disability around the world (World Health Organization, 2008). Schizophrenia has a great impact on the functional performance of people in several domains, including independent living, social function and work function (Dickerson, Bellack & Gold, 1997; Jaeger, Berns & Czobor, 2003; Wallace, 1986). The need for intensive and ongoing mental health services could contribute to as high as 75% of mental health expenditures (Martin & Miller, 1998). Among these functional areas, work is regarded as one of the most important dimensions of recovery. Successful employment participation is linked to improvement in self-concept, self-efficacy (Strong, 1998), and subjective wellbeing (Laird & Krown, 1991), as well as symptom reduction (Bell, Lysaker & Milstein, 1996; Bell, Milstein & Licker, 1993). Unfortunately, many studies showed that only 10% to

30% of persons with schizophrenia were successful in competitive employment (Equal Opportunities Council, 1997; Marwaha & Johnson, 2004; Cheung, 2016).

Work performance and employment is widely regarded as a very important functional outcome in the rehabilitation of persons with schizophrenia. Facilitating persons with schizophrenia to return-to-work and to achieve the optimal work outcome is a major role of occupational therapy in Hong Kong. This thesis would focus studying how work outcome is linked to social cognition. In fact, there were extensive efforts to identify the determinants of work outcome among persons with schizophrenia in the past 20 years (Green, 1996; Green, Kern, Braff & Mintz, 2000; McGurk & Meltzer, 2000). For instance, impairment in attention and memory could create challenges in learning work procedures, and could lead to decrease in work speed and quality. Weaknesses in executive functioning could limit patients' capacity to activate effective problem solving strategies in handling non-routine problems at workplace (Bell & Bryson, 2001; Green, 1996; Velligan, Bow-Thomas, Mahurin Roderick, Miller & Halgunseth, 2000).

Many empirical studies found that neurocognition (including attention, memory, and executive functioning) is a key predictor of future work performance and employment, and could account for 20% to 40% variance of various measures of community functioning including work functioning (Couture, Penn & Roberts, 2006). However, more recent meta-analysis revealed that neurocognition may only account for 6% variance of functioning in community (Fett, Viechtbauer, Penn & van Os, 2011). These results suggest that there are other determinants of work functioning, and social cognition (or social thinking) was often proposed as an alternative determinant of work functioning (Couture, Penn & Roberts, 2006). This hypothesis is based on common

clinical observations that persons with schizophrenia often have specific perceptual biases and social judgment patterns that significantly affect their communication and relationships at work.

2.3 Social cognition

Social cognition refers to how people think about themselves and others in the social world (Marcopulos & Kurtz, 2012). It is formally defined as the mental operation that underlies social interactions, including perceiving, interpreting, and responding to the intentions, dispositions, and behaviors of others (Fiske & Taylor, 1991). As the construct of social cognition encompass a number of mental processes and social responses, there had been ongoing debates on the scope and boundaries of the construct of social cognition in schizophrenia research. In 2008, a general consensus on the conceptualization of social cognition was reached at a US National Institute of Mental Health (NIMH) workshop (Green et al., 2008). Social cognition is now conceptualized as encompassing the four key domains of: 1) Emotion perception (EP), 2) Theory of mind (ToM), 3) Attributional style, and 4) Social perception/knowledge. In additional, the tendency to Jump-To-Conclusions (JTC) is a common issue in social perception of person with schizophrenia, and many social cognitive training programs for persons with schizophrenia are designed to address and modify JTC bias (Roberts & Penn, 2009).

Emotion Perception (EP) refers to the ability to infer emotional information (i.e. what a person is feeling) from facial expression, vocal reflection or a combination of both. A meta-analysis of 86 studies on emotion perception published between 1970 and

2007 revealed the persons with schizophrenia had significant impairment in emotion perception (Kohler, Walker, Martin, Healey, & Moberg, 2010). Longitudinal studies revealed that patients continue to have this impairment up to at least 1 year after symptom remission, suggesting facial emotion perception deficit may be an ongoing deficit in schizophrenia (Addington & Addington, 1998; Kee, Green, Mintz & Brekke, 2003). Previous studies often assessed the overall emotion perception through assessment of all or some the basic emotions of happy, sad, angry, disgusted, fear and surprised (Ekman & Friesen, 1975; Kohler, Walker, Martin, Healey, & Moberg, 2010). More recent studies revealed a non-uniform pattern of impairment across the recognition of these emotions. In a recent review of 19 studies on emotion perception in persons with schizophrenia, the frequency of reported deficits in recognition of different basic emotions varied from 44% to 71%: happiness (44%), sadness (50%), disgust (64%), anger (64%), fears (71%) and surprised (71%) (Pomarol-Clotet, et al., 2010). Some studies revealed greater deficits in identifying negative-valence emotions (Kohler et al., 2003; Bediou et al, 2005; van't Wout et al., 2007) while some documented specific deficit in identifying fear (Hall et al., 2008) and perhaps surprise (Pomarol-Clotet et al., 2010).

Theory of mind (ToM) refers to the cognitive ability to attribute thoughts, beliefs and intentions to people, allowing an individual to explain, manipulate and predict behavior (Sprong, Schothorst, Vos, Hox, & Engeland, 2007). Based on attributions in ToM, a person would choose alternative interpersonal responses that may lead to different interactive outcomes in social situations. ToM encompassed several sub-abilities and was assessed using a range of tasks including false belief/deception tasks,

comprehension of indirect speech, intention-inferencing tasks and eye tasks (to infer mental states from looking at pictures of eyes) (Bora, Yucel & Pantelis, 2009; Sprong, Schothorst, Vos, Hox, & Engeland, 2007). Among these sub-abilities, intention-inferencing ability is the most commonly mentioned treatment target in social cognitive interventions for persons with schizophrenia (Roberts & Penn, 2009; Horan et al., 2009). Intention-inferencing is defined as the ability to infer a person's intentions from subtle information in interpersonal situations.

There is much evidence that persons with schizophrenia have poorer performance in ToM tests when compared with healthy controls (Frith & Corcoran, 1996; Mazz, De Risio, Surian, Roncone & Casacchia, 2001). The mean effect sizes ranged from around -.9 to -1.4 (Sprong, Schothorst, Vos, Hox, & Engeland, 2007; Bora, Yucel & Pantelis, 2009), and the ToM performance among people with schizophrenia was more than one standard deviation below that of healthy controls.

Attributional style is defined as an individual's characteristic tendencies in explaining the causes of events in their lives. Several studies revealed people with schizophrenia present certain patterns in attributional styles when compared with healthy controls. First, the external-personal attribution refers to the tendency to blame others for negative events (Aakre, Seghers, St-Hilaire, & Docherty, 2009; Lincoln, Mehl, Exner, Lindenmeyer, & Rief, 2009). It was postulated that this attribution style act as a defense from diminishing self-esteem through attributing negative events to external factors, which is also known as self-serving bias (Kaney & Bentall, 1992). Second, the hostile attribution style is the tendency to infer hostility when the threat does not actually exist. This attribution style is regarded as a plausible factor in the development

of paranoid thought (Freeman, 2007) before the possible onset or development of persecutory delusion.

Jump to conclusion (JTC) tendency refers to making overconfident probabilistic judgments based on minimal gathering of data (Mckay, Langton & Coltheart 2005). Two parameters, i.e. the degree of hasty data gathering and making over-confidence judgment, could be measured to reflect JTC tendency. It is consistently observed that individuals with delusions have a hastier data gathering compared with healthy controls in all ten studies reviewed by Freeman, 2007). Most of these studies used an experimental probabilistic reasoning task, the Beads Task, to assess the extent of data gathering. Individuals with delusions requested fewer pieces of information (i.e. to see fewer beads drawn from the jar) before making a decision compared with non-clinical controls, suggesting higher jump-to-conclusion tendency.

2.4 Conceptual framework on assessment of social cognition

The section discusses the complex inter-play among social cognitive processes and work outcomes in persons with schizophrenia. Work outcome is conceptualized as closely related to neurocognition (Figure 1). From current literature, there is much evidence showing that neurocognition alone could be a good predictor of outcomes of work success, including work performance, number of work hours within a specific period and salary (Bell, Tsang, Greig & Bryson, 2009; Green et al., 2004; Nuechterlein et al., 2011). Neurocognitive function (attention, memory, executive function) enables an individual to learn work procedures, to ensure work speed and work accuracy and to

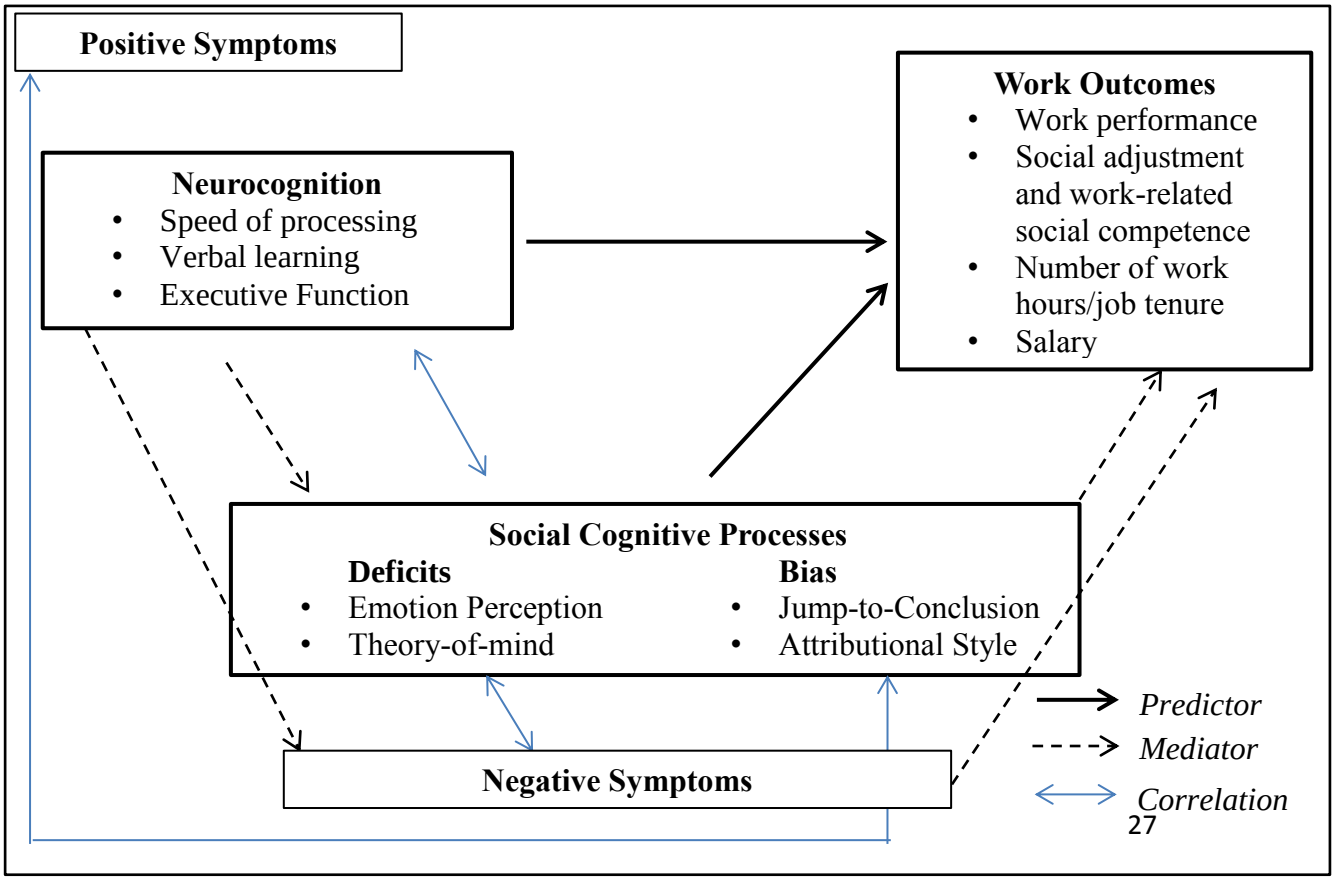
deal with work-related problems efficiently and effectively. Among the wide range of neurocognitive abilities, speed of processing, verbal learning and executive function were more consistently found to be important predictors (Fett, Viechtbauer, Penn & van Os, 2011; Fujii & Wylie, 2003; Velligan, Bow-Thomas, Mahurin Roderick, Miller & Halgunseth, 2000).

Apart from neurocognition, there were suggestions that neurocognition could in turn be influenced by the presence of positive and negative symptoms (Nieuwenstein, Aleman & de Hann, 2001). The assessment of positive and negative symptoms is proposed to be included in the framework of evaluation of social cognition as symptoms clearly impact on aspects of cognition. Several empirical studies found that negative symptoms could significantly mediate the relationship between neurocognition and functional outcomes, while the correlations between positive symptoms and functional outcome were generally weaker (Ventura, Hellemann, Thames, Koellner & Nuechterlein, 2009). This thesis proposed that negative symptoms could impact on neurocognition, while both negative and positive symptoms could impact on social cognition and work performance. For instance, it is well known that there are significant correlations between negative symptoms and some social cognitive processes like emotion perception and theory-of-mind (Sergi et al., 2007b). On the other hand, paranoid symptoms (an aspect of positive symptoms) correlated positively with hostile attributional bias (one of key social cognitive processes) (Combs et al., 2009).

Social cognition is conceptualized as comprising of four components of emotion perception, theory-of-mind, jump-to-conclusion, and attribution style. It is regarded as highly related to neurocognition (Green et al., 2008; Sergi et al., 2007b), and a mediator

between neurocognition and functional outcomes (Schmidt, Mueller & Roder, 2011). It is clear that some social cognitive abilities require good neurocognitive function (Hoe, Nakagami, Green & Brekke, 2012). For instance, a person with good attention and memory would contribute his/her understanding of others' emotion (emotion perception) and intentions (ToM) of co-workers. This could help the person to address to others' needs at workplace and avoid misunderstanding. However, recent literature suggested that social cognition could have its unique contribution to work or community functioning (Mancuso, Horan, Kern & Green, 2011; Green et al., 2010) and should be evaluated as a standalone predictor of functional outcome. In this study, it is hypothesized that better neurocognitive function directly contributes to better work outcomes, as well as indirectly through social cognitive functioning.

Figure 1: A conceptual framework on assessment on social cognition and its relationship with neurocognition, symptoms, and work outcomes



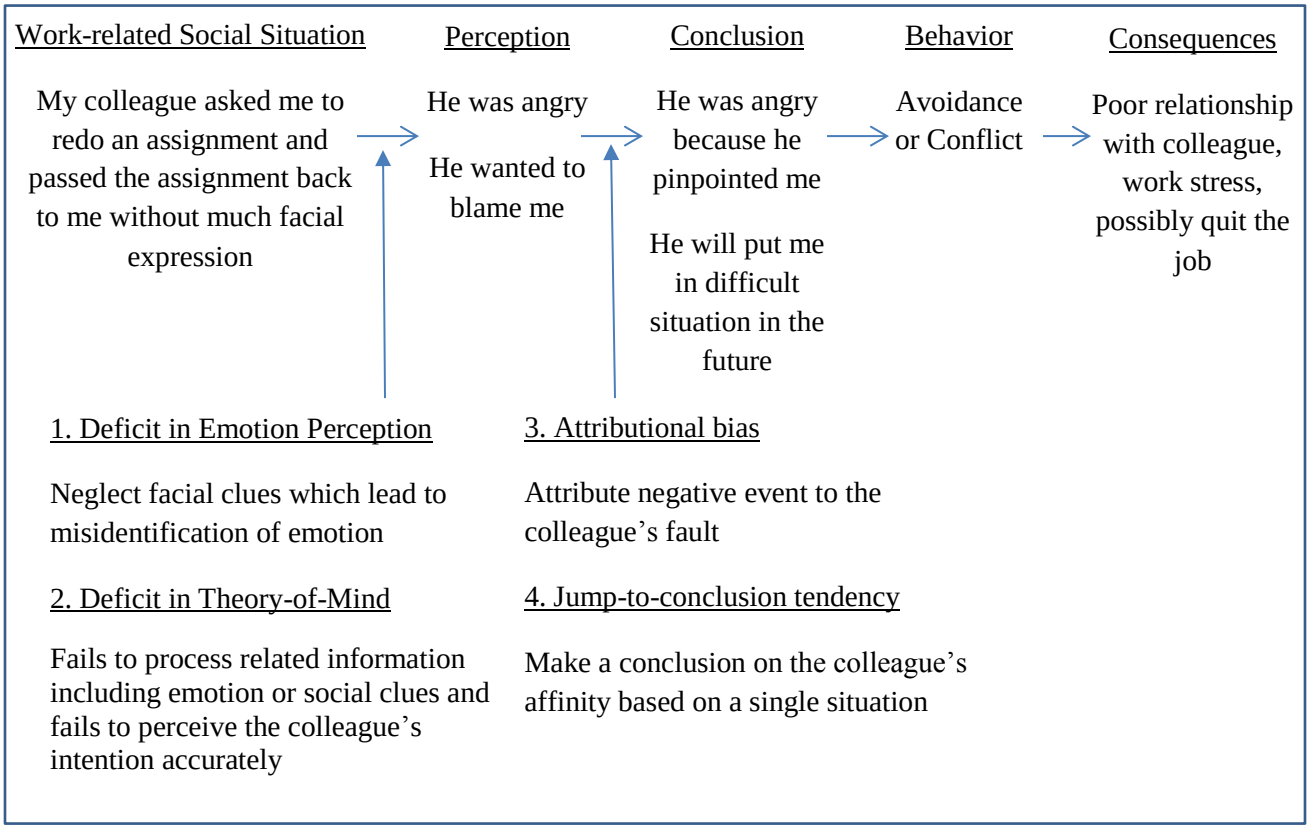
2.5 Social cognition and work functioning

Perceptional biases and deficits in the four social cognitive processes could lead to significant difficulties in social adjustment in the workplace. Deficits in EP are closely linked to the neglect of facial cues and the misperception of neutral emotions as anger, eliciting a hostile attitude toward coworkers. ToM deficits may become a barrier to understanding the meaning behind instructions given by supervisors or customers. One may also misunderstand what others want to communicate and fail to address their needs.

Figure 2 presented the case study of a person with schizophrenia, explaining how the social cognitive processes could impact on his/her social responses and relationships. Suppose a person which schizophrenia is approached by his/her colleague to redo an assignment. If the colleague does not display explicit facial clues, the person might neglect subtle facial clues of the colleague and misidentify the colleague's emotion as anger (deficit in emotion perception). The person might also fail to process related emotional or social cues and fail to accurately identify the colleague's intention accurately (deficit in theory-of-mind). With the tendency to attribute negative events to others' fault (attributional bias) or tendency to make conclusion based on inadequate evidences (jump-to-conclusion tendency), the person might conclude that the colleagues is blaming him and that the colleague will continue to put him/her in difficulty situations in the future. This conclusion would lead to possible conflict or avoidance behavior, affecting further communication and establishment of effective working relationship

with the colleague. As negative social experience accumulates out of deficits in social cognitive abilities, it is possible that this person finds work relationships too stressful and ends up quitting the job.

Figure 2: Case illustration of how social cognitive processes in persons with schizophrenia may impact on work outcomes



In summary, dysfunctional social cognitive processes in persons with schizophrenia could lead to barriers in communication or developing relationship in the workplace, ending up with poor work outcomes. However, current evidence on the specific relationship between social cognition and work functioning is mixed. Social cognition was often seen as a mediator of the relationship between neurocognition and work

performance while the interplay of the three variables were complex (Mancuso, Horan, Kern & Green, 2011). The study by Vauth, Rusch, Wirtz & Corrigan (2004) suggested that 25% of work-related social skills were explained by social cognition and neurocognition, while neurocognition accounted for 83% of variance in social cognition. Bell, Tsang, Greig & Bryson (2009) showed that social cognition and social competence, mediated the relationship between work performance. On the other hand, there were studies showing no significant relationship between some aspects of social cognition and global community functioning or work performance (Couture, Granholm & Fish, 2011; Schmidt, Mueller & Roder, 2011). These inconsistent results make it difficult to draw clear conclusions on the relationship among these variables at this stage.

There are also rooms for improvement in the design and methodology of previous studies on social cognition. First, most previous studies assessed only one or two aspects of social cognition, such as emotion perception or theory-of-mind domain, to represent social cognition construct (Green et al., 2008). The study by Mancuso, Horan, Kern & Green (2011) is an exception, as it included to emotion perception, theory-of-mind and attributional style in assessment of social cognitive processes. Second, among the many studies on relationship between social cognition and work outcomes, most of them are cross-sectional in nature (Bell, Tsang, Greig & Bryson, 2009; Brekke, Kay, Lee & Green, 2005; Mancuso, Horan, Kern & Green, 2011). To further examine the relationship between social cognition and work outcomes, there is a need to collect longitudinal work outcomes data and examine how they are related to social cognitive assessment results.

2.6 Assessment of social cognition

The number of research studies on social cognition in schizophrenia had substantial growth in the recent 5 to 10 years worldwide (Green & Horan, 2010), however, the systematic measure of social cognition remained problematic due to issues in reliability and validity of social cognitive tests (Pinkham, Penn, Green & Harvey, 2015). The SCOPE study is one of the first comprehensive study that evaluated the psychometric properties of common social cognition measurements in schizophrenia. It identified the Bell Lysaker Emotion Recognition Task (BLERT) and Hinting task as the best instruments for measuring social cognition. However, these two tests focus on assessment of emotion perception (of six basic emotions) and intention-inferencing ability (aspect of theory-of-mind). The SCOPE study did not identify or create psychometrically sound measures of attributional style or jumping to conclusion, suggesting there are no gold standard measures in these two social cognitive processes. Thus a more comprehensive review of social cognitive assessment instrument is presented in the next section.

To prepare for conducting a comprehensive evaluation of social cognition in persons with schizophrenia in this thesis, I reviewed 12 social cognitive assessments that have been used in current literature (Table 1). For each instrument, I analyzed the social cognitive domains it assesses and the strength and weakness of the tool. It is noted that assessments on emotion perception (EP) were relatively more commonly available, followed by theory-of-mind (ToM) and attributional style (AS). There was only one available assessment that measured jump-to-conclusion tendency (JTC) in details.

Table 1. Review of strengths and limitations of common social cognition assessment tools

Assessment Tool	Author(s), Year	SC Domains Covered	Applied in Studying Persons with Schizophrenia in Chinese Population?	Strengths	Limitations
Facial Emotion Identification Test (FEIT)	Kerr & Neale, 1993	EP (6 emotions)	Leung, Lee & Lee, 2011	1. Adequate test-retest reliability 2. Photos validated in Chinese population	1. Not include photos that tests neutral facial expression
Bell Lysaker Emotion Recognition Task (BLERT)	Bryson, Bell & Lysaker, 1997	EP (6 emotions + no emotion)	No	1. Adequate test-retest reliability, moderately correlated with functional measures (Pinkham, Penn, Green & Harvey, 2015)	1. Photos only use male poser, possible gender bias (Going & Read, 1974) 2. Photos not validated in Chinese population
Facial Expression Subtest of the Diagnostic Analysis of Non-Verbal Accuracy	Tseng, 2003	EP (4 emotions – happiness, sadness, anger and fearful)	Pan, Chen, Chen & Liu, 2009	1. Photos are Han and Mandarin faces, more appropriate for use with Chinese populations. 2. Photos validated in Chinese population	1. Only measure 4 out of 6 basic emotions 2. Not include photos testing neutral facial expression
Facial Emotion Categorization test	Huang et al., 2012	EP (detection of emotion from happy-angry continuum)	Tsui et al., 2013	1. Photos validated in Chinese population	1. Do not evaluate EP of basic emotions
Mayer-Salovey Caruso Emotional Intelligence Test (social cognition subtest in MATRICS Consensus Cognitive Battery)	Mayer, Salovey, Caruso & Gill, 2003 Eack et al., 2010	Emotion perception, facilitation, understanding, and management	Lin et al., 2013	1. Good test-retest reliability, divergent/convergent validity (Eack et al., 2010)	1. Only low correlations with functional measures (Eack et al., 2010) 2. Measure EP as a small part of emotion management
Faus Pax Recognition	Bora, Yucel & Pantell, 2009	ToM (ability to detect whether a speaker says something without considering whether or not the listener might	Zhu et al., 2007	1. Good test-retest and inter-rater reliability	1. Not a common training target in social cognition training for persons with schizophrenia

Assessment Tool	Author(s), Year	SC Domains Covered	Applied in Studying Persons with Schizophrenia in Chinese Population?	Strengths	Limitations
		want to hear it)			
Reading the Mind in the Eyes Tests (Eyes' Test)	Baron-Cohen et al., 2001	ToM (capacity to infer mental state of others from expressions in the eye region of face)	Zhu et al., 2007 Wong et al., 2013	1. Good test-retest reliability, known-group validity and moderately correlated with functional measures (Pinkham , Penn, Green & Harvey, 2015)	1. Some criticized that it is a measure of EP or empathy rather than ToM 2. Not a common training target in social cognition training
Hinting Tasks	Corcoran, Mercer & Fritch, 1995	ToM (ability to infer intention of others from indirect speech)	No	1. Good test-retest reliability, known-group validity, moderate correlate with functional measures (Pinkham Penn, Green & Harvey, 2015) 2. Measure of intention-inferencing (training target of social cognition training)	1. Small ceiling effect in higher functioning schizophrenia sample (Pinkham, Penn, Green & Harvey, 2015); Roberts, Kleinlein & Stevens, 2012)
Beads Task	Mckay, Langton & Coltheart 2005	JTC	No	1. The only validated measure on jump-to-conclusion tendency	1. Experimental probabilistic reasoning task, lack ecological validity (Lincoln et al., 2011)
Ambiguous Intentions and Hostility Questionnaire (AIHQ)	Combs et al., 2007	AS (detect hostile attributional bias)	No	1. Training target of social cognition training	1. No correlations with functional measures 2. Acceptable test-retest reliability
Attributional Style Questionnaire	Peterson et al., 1982	AS (attribution tendency in 3 dimensions)	Wang et al.,2013		1. Not a common definition of attributional style in schizophrenia
Social Cognition and Screening Questionnaire (SCSQ)	Roberts, 2009	ToM AS JTC	No	1. Relatively comprehensive to assess three social cognition domains 2. Could be completed in a reasonable timeframe	1, Only 1 published study to support its psychometric properties (Kanie et al., 2014)

Among the five assessments on EP, four of them had been used in studying persons with schizophrenia in Chinese population (Leung, Lee & Lee, 2011; Lin et al., 2013; Pan, Chen, Chen & Liu, 2009; Tsui et al., 2013). A common critique of these EP assessments is that they did not cover all the six basic emotions (Pan, Chen, Chen & Liu, 2009; Tsui et al., 2013). There were also critics that some studies (e.g. Lin et al., 2013) did not require examinees to identify neutral facial expression, which may not reveal the known EP bias in persons with schizophrenia. Some studies showed that persons with schizophrenia were prone to identify negative emotions of 'disgust' and 'anger' in neutral facial expressions (Kohler et al., 2003). The photo set used in BLERT is the most comprehensive which included all basic emotions and no emotions (neutral) faces. This photo set, however, had questionable applicability in Chinese population as it uses Western posers. The difference in proportions of male and female posers in BLERT (only male posers are used) could also give possible different results (Going & Read, 1974).

In the domain of ToM, the three assessments reviewed measured different sub-abilities of the ToM construct. The tests on Faux Pax Recognition and Reading the Mind in the Eyes Tests measured the ability to detect whether a speaker says something without considering whether or not the listener might want to hear while the Eyes Tests measured the capacity to infer mental state of others from expressions in the eye region of face. The Eyes' Test had potential issue in validity, as it appeared to measure emotion recognition abilities or empathy rather than ToM (Sprong, Schothorst, Vos, Hox, Engeland, 2007). Hinting Tasks (Corcoran, Mercer & Fritch, 1995) possessed sound psychometric properties and assessed the intention-inferencing ability, which is one of

the most common ToM treatment targets in social cognitive interventions (Roberts & Penn, 2009; Horan et al., 2009). This test is however not available in Chinese and was found to have ceiling effect in higher functioning cases.

There were two assessments that measure AS in persons with schizophrenia. The AIHQ was designed to assess hostile attributional style, which is a commonly observed in persons with schizophrenia. This assessment, however, has fair psychometric properties and is not available in Chinese. The Attributional Style Questionnaire had been employed to evaluate treatment outcome after social cognitive intervention in Chinese schizophrenia population. The ASQ measured subjects' tendency to adopt extreme or over-confident judgment, which is not a commonly-referred attributional bias among persons with schizophrenia.

In the domain of JTC, there is only one available assessment, the Beads Task, and was not yet available for application with Chinese populations. The Beads Task assessed the participants' Jump-To-Conclusion tendency by tapping the degree of hasty decision making in a non-social experimental situation. This was evaluated by counting the number of hints a participant required before making the decision on the location of colored beads placed in hidden jars. The less hints a participant required suggests a higher degree of hastier decision making and thus indicating a higher jump-to-conclusion tendency. This test is designed as a specific research task and there were criticisms on its ecological validity. As JTC tendency was found to be more prominent when the stimulus material was more relevant to day-to-day decisions (Young and Bentall, 1997), was more emotional-aroused (Warman & Martin, 2006) or self-referent

(Lincoln et al., 2011). It is therefore doubtful if the Beads Task measures jump-to-conclusion tendency in real life social situations.

Among the instruments reviewed, there is only one instrument, SCSQ, that provide more comprehensive evaluation on social cognition. It assesses the domains of ToM, JTC and PAS, and could be completed in a reasonable timeframe, within half an hour. The key drawback is that it is not available in Chinese and did not cover emotion perception ability for comprehensive evaluation of social cognition construct.

In summary, there are a number of limitations in current instrument for assessing social cognition in Chinese persons with schizophrenia. For instruments assessing emotion perception (EP), most shared the same limitation that neutral facial expression photos were not included or that the genders of posers were not balanced in BLERT. For instruments assessing ToM and AS, Hinting task and AIHQ appear to possess most sound psychometric properties. These instruments, however, were not available in Chinese. The only instrument that assessed JTC, the Beads Task, was questioned for its ecological validity (Lincoln et al., 2011) and thus its generalization to assess JTC tendency in social situation. Furthermore, it could be time-consuming in clinical application to adopt four different assessments to assess a person's social cognitive ability comprehensively. Of the instruments reviewed, only SCSQ provided a more comprehensive evaluation of social cognition including the domains of ToM, JTC and PAS. It is possible we could use SCSQ together with FEIT (which assesses emotion perception), to form a comprehensive social cognitive assessment battery that could be administered in a reasonable timeframe. Translation of SCSQ and local validation of this battery are essential before this battery could be used.

2.7 Justification for Study

2.7.1 Research Gap

First, there has been increasing evidences that social cognition plays an important role in community and work functioning. There were, however, very few studies that examine the social cognitive functioning of persons with schizophrenia in Chinese population. There is a need to draw on existing evidence and propose a conceptual framework for describing how social cognition is related to neurocognition, symptoms variables, and work outcome. This framework could also act as a guide on assessment methodology of social cognition for persons with schizophrenia.

Second, there is a need to develop a Chinese assessment tool that provides a more comprehensive evaluation of social cognitive domains. In particular, the new instrument should address several issues in previous studies, such as the testing of neutral facial expression, intention-inferencing ability, hostile attributional style and jump-to-conclusion tendency should be included in the evaluation.

Third, current literature suggested that neurocognition impact on work functioning and proposed social cognition as a potential mediator in this relationship. Assessment of social cognition will make sense if social cognitive abilities is found to be directly or indirectly related to work functioning in persons with schizophrenia. Yet, there are mixed results on the relationship between social cognition and work functioning. This study aims to study the relationship between social cognitive function and work

functioning using a longitudinal design, which address some of the methodological issues in previous studies.

Fourth, there is a need to examine if neurocognition and social cognition are two distinct constructs by exploring the factor structure of instruments designed to measure these variables.

2.7.2 Aims and objectives of Stage I Study

The aim of stage I study is to validate two social cognitive assessments, the Chinese Facial Emotion Identification Test (C-FEIT) and the Chinese Social Cognition and Screening Questionnaire (C-SCSQ), which form a battery to evaluate the four key social cognitive domains among persons with schizophrenia. The objectives of the study is:

1) to examine the content-related validity of C-SCSQ,
2) to examine the test-retest reliability,
3) to examine the known-group validity and
4) to investigate the predictive validity of the two assessments.

2.7.3 Aims and objectives of Stage II Study

The aim of stage II study is to examine the predictive validity of social cognition, neurocognition and clinical variables on longitudinal work outcomes. The three research questions to be answered are:

1) How far are neurocognition and social cognition distinct constructs in the evaluation of social cognition in person with schizophrenia?
2) How far could social cognition and neurocognition predict work status?
3) How far are social cognition, neurocognition, and clinical variables associated with work outcomes, such as job tenure and salary?

Chapter III

STAGE I: VALIDATION OF SOCIAL COGNITIVE ASSESSMENT BATTERY

3.1 Introduction

This chapter presents the methodology and results of stage I study, which aims at examining the reliability and validity of a social cognitive assessment battery, consisting of the Chinese-Facial Emotion Identification Test (C-FEIT) and the Chinese-Social Cognition and Screening Questionnaire (C-SCSQ). The two instruments were selected to form a battery that provide a comprehensive assessment of social cognition in persons with schizophrenia. The objectives of the validation study are to examine the content-related validity, known-group validity, test-retest reliability and predictive validity of the C-FEIT and C-SCSQ in assessing the four domains of social cognition that are important in the assessment of social cognition of persons with schizophrenia (as discussed in literature review).

3.2 Methodology

3.2.1 Sample

A convenience sampling method of 30 participants with schizophrenia were recruited for the patient group, whereas 20 participants with no history of mental illness were recruited for the control group. The patient group includes participants who are aged 18-60 and have a diagnosis of schizophrenia according to the International Classification of

Diseases version 10 (ICD-10). All the participants were taking antipsychotic medication during the study period. The exclusion criteria were: 1) Dual diagnosis, such as neurological disorder, developmental disability, or substance abuse; or 2) Admission to in-patient psychiatric treatment or a change in psychiatric medication within the last 30 days.

The participants of the control group were recruited from a local church. Participants were included if they are aged 18-60 with no history of psychiatric illness. The age and gender of the participants in control group were matched with the patient group.

3.2.2 Sample Size Estimation

From previous studies that compared social cognitive function between schizophrenia and non-psychiatric or control groups, effect sizes ranged from .91 for emotion perception (Kohler, Walker, Martin, Healey, & Moberg, 2010), .90 - 1.08 for theory-of-mind (Bora, Yucel & Panetils, 2009), and 2.47 for hostile attributional style (Combs et al., 2009). Using the assumption that effect size is .90, the sample size required for reaching power of .80 is 20 subjects per group as calculated by PASS12 (Hintze, 2013). A total of 20 non-psychiatric control subjects were recruited.

For sample size needed for correlational analyses, the correlations between social cognitive functioning and functional outcomes ranged from .31 to .52 (Fett, Viechtbauer, Penn & van Os, 2011; Mancuso, Horan, Kern & Green, 2011). Assuming the correlation is .50, twenty nine subjects is needed to reach the power of .80. In

summary, the researcher plans to recruit 20 control subjects for comparison with patient group, and at least 30 persons with schizophrenia for correlational analyses.

3.2.3 Procedures

Ethics approval of this study was obtained from the Department of Rehabilitation Sciences, The Hong Kong Polytechnic University and the New Territories West Cluster of the Hospital Authority. Prior to data collection, the purpose of the research study was explained to the target groups and those who agreed to join are requested to sign a consent form. Demographic and clinical data including age, gender, years of education, age of onset/duration of illnesses, type of antipsychotic medication, were collected from case medical record. Data on chlorpromazine equivalent dosage was not included or could be controlled in the study. In fact, the effect of antipsychotic on cognitive/social cognitive function remained controversial for some years but recent evidence suggested that antipsychotic medication do not have significant effect on various measures of social cognition (Sergi et al., 2007a).

The researcher administered the two social cognitive assessments, C-FEIT and C-SCSQ, to all participants. For evaluation of test-retest reliability, the C-FEIT and C-SCSQ were administered to 17 participants over a period of one-week. The case occupational therapists rated participants' work performance using CWPP after observing them for at least 10 sessions in work training.

3.2.4 Instruments

Chinese-Facial Emotion Identification Test (C-FEIT). The FEIT is an assessment procedure widely used to assess facial emotion perception ability in social cognition research (Kerr & Neale, 1993). The 21-photo set used in the C-FEIT comprised of 12 photos conveying the six basic emotions (happy, sad, anger, disgust, fear, surprise) and 9 photos conveying neutral emotion. The 12 photos were selected from the Japanese and Caucasian Facial Expression of Emotion (JACFEE) photo set (Matsumoto & Ekam, 1988), which was found to have acceptable levels of agreement in a study of 120 Chinese subjects (Yip & Lee, 2003). The 9 photos posed by Japanese posers were selected from the Japanese and Caucasian Neutral Faces (JACNeuF) (Marsh, Elfenbein & Ambady, 2003; Matsumoto & Ekam, 1988).

In constructing the C-FEIT used in this study, I made a few changes to the original FEIT to address some methodological issues identified in previous studies. First, I used photos displaying disgust to replace shame in the FEIT, as disgust is widely regarded as one of six basic emotions (Ekman, 1972), and disgust is more commonly use in EP studies of persons with schizophrenia than shame (Kohler et al., 2003; Kohler et al., 2010). Second, I used an equal number of photos displaying different emotions to address the unequal number of emotional photos in the original FEIT. Third, the photo set JACFEE and JACNeuF (photos with neutral emotion) were chosen, this photo set is one of the gold standards of facial expressions (Matsumoto & Ekman, 1988). In fact, a similar photo set using non-Chinese faces had been validated for use with Chinese population, and agreement level was acceptable (N = 120) (Yip & Lee, 2003). It would be best to use photos Chinese faces to portray the six basic emotions in the test, but there

is not yet any validated photo set of Chinese faces available for the FEIT (Gao et al., 2008).

A Chinese version instruction sheet was used to guide the administrator to give standardized test instruction. The 21 photos were presented in random order using a MS PowerPoint file, which displayed the photos one by one automatically. Several test parameters were standardized during administration. First, the time of exposure and time of rest in between two photos were set at 10 seconds, with reference to the time used in previous overseas studies. Second, the PowerPoint file was presented in either a desktop computer or notebook with screen less than 18", and at an-arm-length distance between the participant and screen. This is to ensure the poser's size and distance simulate the conditions in day-to-day conversation. After viewing each photo, participant was required to select which of the seven emotions were conveyed in the photo, and put the answer in the answer sheet. Participants' responses were recorded and marked as correct or incorrect.

Chinese-Social Cognition and Screening Questionnaire (C-SCSQ) Social Cognition Screening Questionnaire (SCSQ) is a social cognitive assessment designed to assess three key aspects of social cognition, including theory-of-mind, jump-to-conclusion and paranoid attributional style (Roberts and Penn, 2009). The instrument also intends to screen for neurocognitive deficits and client's needs for social-cognitive intervention. The SCSQ presents 10 second-person interpersonal vignettes, and each vignette describes an ambiguous interpersonal situation. The vignettes are presented to the participant verbally, then the participant is required to answer three yes/no question and one confidence judgment question on an answer sheet. The vignette could be presented

either to an individual or to a group. Two of the yes/no questions test on participant's ability to recall details in each vignette, the total number of correct score is summed up as "neurocognitive score" (NC) (0-20). The remaining yes/no question is an intention-inferencing task which test on participant's ability to infer character's intentions from information in the vignette, the total number of correct score is summed up as "perspective taking/ToM score" (ToM) (0-10). The confidence judgment question assesses the participant's tendency to make over-confidence judgment and contribute to the "JTC score" (JTC) (0-4). It is computed by averaging the JTC score, i.e. level of certainty in answering ToM questions, in the incorrectly answered ToM questions. The "paranoid attributional bias score" (PAS) is calculated by summing the incorrectly answered perspective taking part in vignette 2,3,5,6 and 9 (0-5), in which a negative self-directed thoughts or feelings is suggested. Higher scores in "NC" and "ToM" subscales indicate better neurocognitive functioning and theory-of-mind ability. Higher scores in "JTC" and "PAS" indicate higher tendency to jumping to conclusion and to adopt hostile attributional bias respectively which are social cognitive biases that adversely impact one's social functioning. Approval was first obtained from the author to translate the original English version SCSQ into Chinese and validate the translated version.

The original version of the SCSQ was translated from English to Chinese by a qualified translator using the idiomatic translation method. A 4-member expert panel was set up to: 1) Appraise and provide suggestions to improve the quality of the translation, taking into account the semantic equivalence of the two version, fluency and clarity of translation; 2) Evaluate the content-related validity (relevance and

representativeness) of the C-SCSQ. The panel members were mental health professionals, including a psychiatrist, a clinical psychologist, an occupational therapist who specialized in mental health field and an occupational therapist who specialized in cognitive rehabilitation. All panel members were bilingual, and have at least ten years of practice experience in psychiatry. The final version of C-SCSQ was prepared after modifications of items based on comments from experts.

The Chinese Work Personality Profile (CWPP) is a behavioural rating scale for situational assessment of job maintenance skills, and it is rated by professionals or trained assessors. Translated from the WPP (Bolton & Roessler, 1986), the CWPP is designed for the assessment of critical work role requirements of people in vocational rehabilitation (Siu, Yau, & Lam, 1998). It consists of 58-items and it contributes to five subscale-scores, task orientation, social skills, self-control, attitude, personal appearance and a total score. Good discriminative and predictive validity on future work placement was proven (Law, Siu, Lee & Lee, 2006).

3.2.5 Statistical Analysis

The reliability of C-FEIT and C-SCSQ were estimated using Intra-class Correlation Coefficient (ICC). For, known-group validity, t-test was used to compare the differences in social cognitive performances between patient group and control group matched for age and gender with the patient group. The inter-correlations between C-FEIT and subscales of C-SCSQ were examined using correlational analyses. The predictive validity with indexes of functional measures was conducted by correlational analysis

and then by constructing a Structural Equation Modeling (SEM) to examine on the relationship between social cognitive measures and work performance.

3.3 Result

3.3.1 Content-related validity of C-SCSQ

All experts agreed that the Chinese translation is semantic equivalent and clear in presentation. Most (75%) of the experts agreed that the translated Chinese version is fluent. Several modifications were suggested by the experts to address issues of cultural relevance. These included replacing “spaghetti” with “fried rice” in test Vignette 3, “Bingo Game” with “Buy Mark Six in Jockey Club”, “Susan/Stan” with “Mei Ling/Wai Man” in Vignette 8, and changing the price of toothpaste from US Dollars to Hong Kong Dollars in Vignette 6. Seventy-five percent of experts agreed that the translated SCSQ is cultural relevant after the above modifications.

The experts agreed that over 90% items had satisfactory content relevance (satisfactory means more than 75% of experts agreed it is satisfactory). The only exception was item 9A - the participant is asked if the person described in the vignette 9 lives out in the country which is not mentioned in the vignette explicitly. Only 50% of the panel members agreed this item is relevant as a measure of memory in the neurocognitive subscale. Among the four SCSQ subscales, the expert rated neurocognitive subscale as having lower content relevance (86.3% agree) than other subscales. Two experts commented that some of the items assessing memory in the neurocognitive subscale is likely to assess social knowledge and comprehension as well.

As for content representativeness, 100% experts agreed the theory-of-mind and jump-to-conclusion subscales as representative, whereas 75% agreed the neurocognitive and paranoid attributional bias subscales as representative. Based on the results of the content-related validity, three items (9A, 9C and 2B) with lower percentage of agreement and three phrases in Vignettes 5, 9 and 10 were modified according to the suggestions of the experts before the translated version was finalized and administered to the study sample.

3.3.2 Sample Characteristics

Of the 30 patient subjects recruited, sixteen (53%) were males. Their mean age at the time of data collection was 41.26 years (SD = 9.23). The mean age of onset of schizophrenia was 24.3 years (SD = 8.43). The mean years of education was 9.0 (SD = 2.9). Two-thirds lived in their own home or with family, while the rest lived in half-way house, supported hostels, or private hostels. The majority (86.7%) received social security benefits. Most (90.0%) were participating in vocational rehabilitation at the time of the study in hospital-based vocational training in simulated work settings (such as clerical and catering). The rest were receiving training in supported employment (6.7%) and sheltered workshop (3.3%).

We recruited 19 non-psychiatric participants for the control group, who were matched in age and gender with 19 participants of the patient group. We compared these 19 pairs of participants for examining the known-group validity of the assessment battery. In both groups, the mean age was 41.2 years, S.D. = 9.0. Fifty-two percent were male. The

patient group had 9.4 years (SD = 3.1) years of education on average, and patient group and the control group had 14.5 years of education (S.D. = 2.5).

Table 2. Descriptive statistics and test-retest reliability of C-FEIT and C-SCSQ (N=17)

	1st Administration	2nd Administration	
Subscales	Mean (S.D.)	Mean (S.D.)	ICC (95% C.I.)
FEIT	14.94 (2.93)	15.53 (3.40)	0.85 (0.57-0.94)
SCSQ			
ToM	6.71 (2.02)	6.06(1.56)	0.76 (0.35-0.92)
JTC	1.95 (0.92)	2.27 (0.78)	0.80 (0.43-0.93)
PAS	1.47 (1.12)	1.76 (1.03)	0.85 (0.60-0.95)
NC	13.41 (3.79)	12.82 (3.23)	0.67 (0.09-0.88)

Note: FEIT = Facial Emotion Identification Test (measure of emotion perception); ToM = Theory-of-mind subscale; JTC = Jump-to-conclusion; PAS = Paranoid/hostile attributional style, NC = Neurocognitive subscale of SCSQ

3.3.3 Test-retest Reliability

The researcher administered the C-FEIT and C-SCSQ twice to 17 of the 30 patient subjects over a period of one week. Their scores are summarized in Table 2. The estimates of C-FEIT and subscales of C-SCSQ had good test-retest reliability, as indicated by ICC between .76 and .85. The ICC of NC subscale of C-SCSQ was .67, which fell short of the standard of ICC $\geq$ .75 for good reliability (Portney & Walkins, 2000).

3.3.4 Known-group validity

The control group participants had significantly more years of education than the patient group ($t = 5.47$, $p < .0001$). As education did not correlate with any of the social-cognitive performance scores in both groups, it was not included as a covariate in further analysis. There were significant differences in social-cognitive performance between patient and control groups in all subscales of the C-SCSQ, but the difference in FEIT between groups was marginally insignificant (Table 3). The effect sizes between-group difference across SC domains ranged from |.56| for FEIT to |3.27| for the PAS. The control group had significantly higher ToM, NC, and JTC scores, but lower PAS scores than the patient group.

Table 3. Group differences on social cognitive performance

Measures	Patients (n = 19)		Controls (n = 19)				
	M	SD	M	SD	t	p	Cohen's d
FEIT	13.63	3.9	15.47	2.5	`-1.72	.094	.56
ToM	6.32	1.2	7.84	1.2	-3.89	<.001	1.26
JTC	1.68	1.2	2.42	1.0	-2.05	.047	.67
PAS	2.93	0.6	0.68	0.7	10.07	<.001	-3.27
NC	13.05	2.1	16.68	1.9	-5.61	<.001	1.82

Note: FEIT: Facial Emotion Identification Test (measure of emotion perception), ToM: Theory-of-mind, JTC: Jump-to-conclusion, PAS: Paranoid attributional style, NC: Neurocognitive subscale of SCSQ

3.3.5 Correlations between C-FEIT and C-SCSQ subscales

The strength of the correlations among the four social-cognitive domains ranged from .17 to .42 (Table 4). The correlations between FEIT and ToM, and between JTC and PAS were positive. FEIT had a negative correlation with PAS, and ToM with JTC and PAS. Neurocognitive score had a significant positive correlation with FEIT ($r = .42$, $p < .05$) and ToM ($r = .57$, $p < .01$).

Table 4. Correlations among the Social-Cognitive and Neurocognitive Measures (N=30)

Variables	FEIT	ToM	JTC	PAS
ToM[+]	0.23			
JTC	0.25	-0.54**		
PAS[+]	-0.28	-0.49** [+]	0.29	
NC	0.42*	0.57**	-0.17	-0.33

p < 0.05. ****p*** < 0.01.

Note. Spearman's ρ was estimated. FEIT = Facial Expression Identification Test (measure of emotion perception), ToM = Theory of Mind, JTC = Jump To Conclusion bias, PAS = Paranoid Attributional Style, NC = Neurocognitive measure.

[+]ToM and PAS scales are not independent

3.3.6 Predictive validity

As discussed in literature review, neurocognition and social cognition are theorized to impact on work functioning. Table 5 presents the correlations among the social-cognitive, neurocognitive, and work performance measures. EP (FEIT scores) had a significant positive correlation with all five domains of work performance (CWPP subscales), with correlation coefficients ranging from moderate (r = .36 for attitude) to high (r = .60 for task orientation). Neurocognitive scores had a moderate positive correlation with three out of five work performance measures, with a smaller strength of r compared with FEIT (r ranging from .37 to .46). I also conducted partial correlations of pairs of relationships with age as a covariate, and most of the partial correlations remained significant as before.

Table 5. Correlations between Social Cognitive, Neurocognitive, and Work Performance Measures (N = 30)

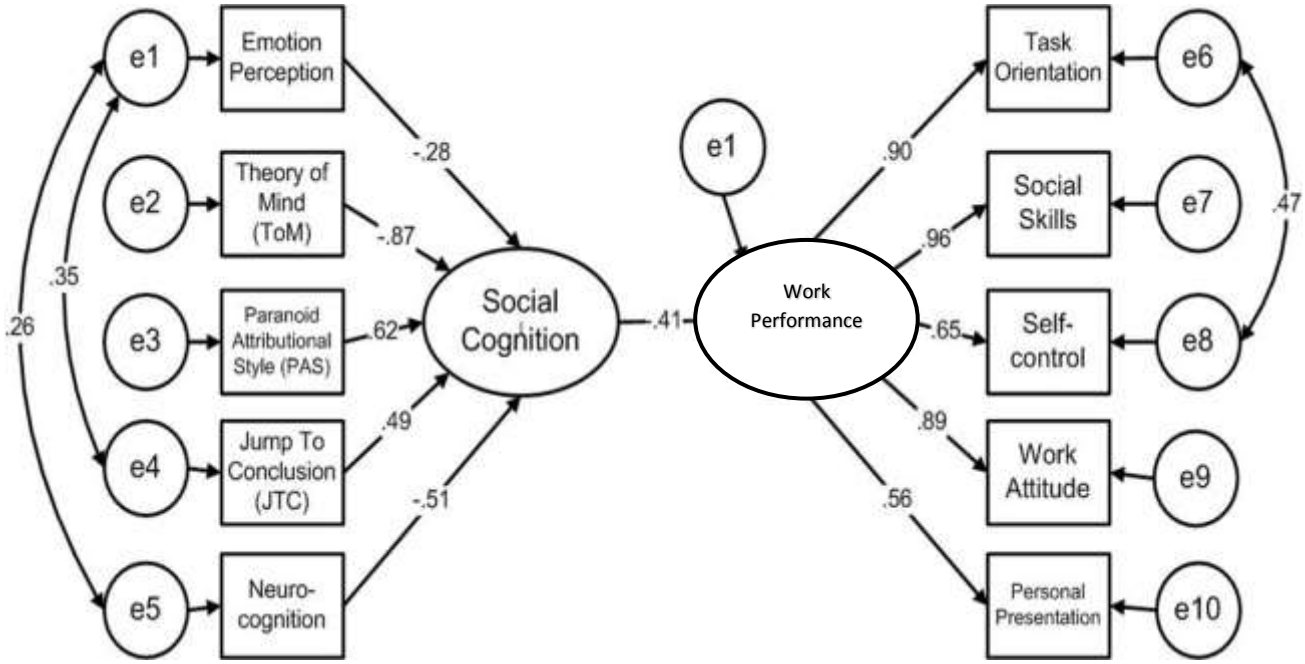
CWPP subscales	FEIT	ToM[a]	JTC[a]	PAS[a]	NC
Task Orientation	.60*** (.59**)	.12 (.03)	.07 (.13)	-.22 (-.18)	.37* (.36)
Social Skills	.58** (.55*)	.28 (.12)	-.13 (.04)	-.31 (-.12)	.46* (.40*)
Self-control	.42* (.39*)	.09 (-.04)	-.03 (.00)	-.04 (.02)	.34 (.28)
Attitude	.36* (.35)	.16 (.13)	.08 (.16)	-.05 (-.04)	.44* (.43*)
Personal Presentation	.51** (.45*)	-.03 (-.15)	.17 (.16)	.04 (.02)	.25 (.14)

*p < .05. **p < .01. ***p < .001

[a]Spearman's ρ was estimated.

Note. The partial correlations for age is shown in brackets. FEIT = Facial Expression Identification Test (measure of emotion perception), ToM = Theory of Mind, JTC = Jump To Conclusion bias, PAS = Paranoid Attributional Style, NC = Neurocognitive measure

Figure 3. Structural equation model on relationship between social cognition and work performance



A structural equation model (SEM) was constructed to examine the relationship between social-cognitive abilities and work functioning (Figure 3). The indicators of social-cognitive abilities included the EP score (measured by FEIT) and the Social Cognition scores (measured by ToM, PAS, JTC, and neurocognitive scores of the SCSQ). The latent variable of social-cognitive abilities is hypothesized to be represented by the five indicators of work performance measured by the CWPP. The initial structural equation model had a fairly good model fit (CFI = .85, RMSEA = .15). Based on the modification indexes, post hoc fitting was conducted. Covariance was added to three pairs of error terms between e1 and e4, e4 and e16, and e8 and e10. With the addition of these paths, model fit increased to a satisfactory level (CFI = .91; RMSEA = .12). The path

coefficients of the structural model were significant and varied from .28 to .96 (absolute values). The SEM results indicated that social cognition had a significant impact on work performance, indicated by a path coefficient of .41. The size of the co-variances newly added to the three pairs of error terms were .26, .35, and .47.

Chapter IV

STAGE II STUDY: SOCIAL COGNITION AND WORK OUTCOMES

4.1 Introduction

The aim of stage II study is to examine how far social cognition, neurocognition and clinical variables could predict longitudinal work outcomes. The three research questions to be answered are: 1) Are neurocognition and social cognition different constructs in the evaluation of persons with schizophrenia? 2) How far could social cognition and neurocognition predict work status? 3) How far are social cognition, neurocognition and clinical variables associated with work outcomes, such as job tenure and salary?

This study recruited a sample of persons with schizophrenia with stable mental condition and collected data on their social cognitive, neurocognitive functioning, clinical symptoms and demographic. At 3 months and 6 months after initial data collection, we collected indicators of work outcomes including work status, job tenure and salary. Factor analysis was used to examine factor structure of NC, the C-FEIT and SC subscales under the C-SCSQ. This aims to explore how NC & SC are linked and also reduce the number of variables for subsequent predictive analysis using logistic regression. Correlational analyses were used to examine associations between

continuous data of work outcomes including job tenure and salary with social cognition, neurocognition, clinical and demographic variables.

4.2 Methodology

4.2.1 Sample

A total of 62 outpatients were recruited from a psychiatric hospital and two community-based mental health services (ran by non-governmental organizations). Participants were included if they are: 1) aged 18 to 60; 2) have a diagnosis of schizophrenia according to the International Classification of Diseases version 10 (ICD-10); 3) receiving vocational rehabilitation at the time of recruitment; and 4) consented to participate in the study. All participants were taking antipsychotic medication. The exclusion criteria were 1) Dual diagnosis, such as neurological disorder, developmental disability, or substance abuse; or 2) Admission to in-patient psychiatric treatment or a significant change in psychiatric medication within the last 30 days.

4.2.2 Procedures

Ethics approval was obtained from the Department of Rehabilitation Sciences, The Hong Kong Polytechnic University and the New Territories West Cluster of the Hospital Authority. Prior to data collection, the purpose of the research study was explained to the subjects and informed consent was obtained from them before data collection began. The demographic and clinical data including age, gender, years of education, age of

onset/duration of illnesses, type of antipsychotic were collected from information from case worker or from retrieving data from case medical record. Data on chlorpromazine equivalent dosage was not included or controlled, as previous studies showed that antipsychotic medication was unrelated to various measures of social cognition in a recent study (Sergi et al., 2007a). The researcher administered all the social cognitive, neurocognitive, clinical symptoms assessments to all participants in 1.5 hours-sessions. A longitudinal research design was adopted that all participants were follow-up at 3-months and 6-months interval after the assessment session.

4.2.3 Instrument

Apart from administration of social cognitive test battery (C-FEIT and C-SCSQ) that was validated in the 1st phase, several neurocognitive tests and assessment of clinical symptoms were also conducted for all participants.

Neurocognitive Measures. Among the wide range of abilities in neurocognition, only speed of processing, verbal fluency (aspect of executive function), verbal memory were measured in this study, as these abilities were more consistently found to be related to real-world functioning (Fett, Viechtbauer, Penn & van Os, 2011; Fujii & Wylie, 2003; Velligan, Bow-Thomas, Mahurin Roderick, Miller & Halgunseth, 2000). Several sub-tests of the MATRICS Consensus Cognitive Battery were selected to assess these domains (Nuechterlein, et al., 2008). **Speed of processing** was measured by Trial Making Test Part A. **Verbal fluency** was measured by Categorical Fluency Test,

Animal Naming (Luteijn & Van der Ploeg, 1983). **Verbal learning** was measured by Hopkins Verbal Learning Test-Revised (HVLT-R) (Brandt, 1991).

Clinical Symptoms. The Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1988) was conducted to measure clinical symptoms. The BPRS is a 18-items, semi-structured interview that rates psychopathological symptoms on a Likert scale from 1, not present, to 7, extremely severe. The possible range of total score was 18 to 168. The mean score of community sample was 1.34 (Wijesundara, Dayabandara, Ellepola & Hanwella, 2011). In current study, two average scores, "total" and "paranoid" score were computed. The "paranoid score" was calculated from the hostility, suspiciousness, tension, uncooperativeness and excitement items of BPRS, which is supported by results of previous studies on the factor structure of BPRS (Peer, Rothmann, Penrod, Penn, Spaulding, 2004). Both the "total score" and "paranoid score" were used in subsequent analysis.

Work Outcomes. Telephone interviews were conducted to collect data on work outcomes of the participants by structured telephone interview, which includes work status ("competitively employed vs "unemployed"), job tenure and hourly salary, at 3 months and 6 months after initial assessment.

4.2.4 Statistical Analysis

Principal axis factor analyses, with oblique factor rotation, were conducted to examine the factor structure of scores of C-FEIT, C-SCSQ subscales, Trial Making Test A (TMT), Hopkins Verbal Learning Test –Revised (HVLT) and Categorical Fluency Test

– Animal Naming (VF). Principal axis factor analysis was chosen as it was a preferred method than the maximum likelihood factor analysis for population solutions with few indicators per factor (De Winter & Dodou, 2012). Oblique rotation algorithm was chosen since the factors identified were expected to be correlated, as suggested in previous studies (Mancuso, Horan, Kern & Green, 2011; Schmidt, Mueller & Roder, 2011). To investigate the relationship between NC, SC and longitudinal work status, logistic regressions were conducted to identify the predictors of work status at 3-months and 6-months. Correlational/regression analyses were conducted to examine association between social cognitive, neurocognitive, symptoms and demographic variables and job tenure/salary at 3-months and at 6-months.

4.3 Result

4.3.1 Profile of participants

Table 6 presents the demographic and clinical characteristics of the participants (N = 62). The participants were a group of outpatients with schizophrenia. They had an average duration of illness of 12.04 years, ranging from 1 year to 33 years. Almost seventy percent (69.4%) of participants had duration of illness more than 5 years. Around half (45.2%) of the participants are males (%). The majority (90.3%) of subjects received atypical medication and the rest received typical medication. All subjects had received anti-psychotic medication for at least 3 months. The BPRS score indicated the sample had slightly fewer psychiatric symptoms than a community sample (Wijesundara, Dayabandara, Ellepola & Hanwella, 2011), and likely that most participants had stable

mental state. The summary statistics of social cognitive and neurocognitive performance were also presented in table 6.

Table 6. Demographic and clinical characteristics (N = 62)

Variables	%	M (SD)
Demographic		
Gender (male)	45.2	
Medication (atypical)	90.3	
Age		37.97 (11.8)
Years of education		10.67 (2.8)
Age of onset		25.93 (9.4)
Duration of illness		12.04 (9.3)
Symptoms		
BPRS total		1.24 (0.2)
BPRS paranoid scale		1.16 (0.3)
Social Cognitive Measures		
FEIT		14.50 (3.9)
ToM		6.32 (1.8)
JTC		2.66 (0.8)
PAS		1.68 (1.1)
Neurocognitive Measures		
TMT		57.97 (23.8)
HVLT		19.92 (6.53)
VF		17.60 (5.2)

Note: FEIT: Facial Emotion Identification Test (measure of emotion perception), ToM: Theory-of-mind, JTC: Jump-to-conclusion, PAS: Paranoid attributional style, NC: Neurocognitive subscale of SCSQ, TMT: Trial Making Test A, HVLT: Hopkins Verbal Learning Test, VF: Verbal Fluency, BPRS total: total score of Brief Psychiatric Rating Scale, BPRS paranoid scale: item 6 (tension), item 10 (hostility), item 11 (suspiciousness), item 14 (uncooperativeness) and item 17 (excitement) of BPRS

Table 7 presents the work status of participants at time of data collection, three-month follow-up and six-month follow-up. At three-month follow up, 19 participants had secured competitive employment. The percentage of participants with open employment was 30.1%, which largely resembles the employment rate of persons with severe mental illness in previous local and overseas surveys (Cheung, 2016; Waghorn & Lloyd, 2005; Mechanic, Bilder & McAlpine, 2002). The remaining 37 subjects (59.7%) were unemployed and 6 subjects were lost to follow up. The mean hourly salary of the competitively employed group was HKD $40.05 (US $5.16) (SD = 12.30), and the average job tenure was 3.30 months (SD = 3.73).

At six months follow up, 15 subjects (24.2%) were having competitive employment while 36 subjects (58.0%) were unemployed. The remaining 11 (17.7%) subjects were lost to follow up. The mean hourly salary of the employed group was HKD $39.53 (US $5.09) (SD = 13.44) and the average job tenure was 6.97 months (SD = 4.78). As there was a high percentage of participants lost to follow up at 6 months, only the data at 3 months follow up would be used in subsequent analysis.

Table 7. Work status of participants (N=62)

Work Status	N (%)		
	Baseline	3-month follow-up	6-month follow-up
Competitive employment	7 (11.3%)	19 (30.6%)	15 (24.2%)
Supported employment	39 (62.9%)	24 (38.7%)	21 (33.9%)
Unemployed	16 (25.8%)	13 (21.0%)	15 (24.2%)
Lost to follow-up	0 (0.0%)	6 (9.7%)	11 (17.7%)
Total	62 (100.0%)	62 (100.0%)	62 (100.0%)

The correlations between demographic and symptoms variables on NC and SC measures were explored to identify cofounding variables to be considered in subsequent analyses. Relationships with continuous variables were analyzed using Spearman's ρ, and associations with binary variables were examined using point-biserial correlation coefficients (Table 8). Most subscales of SCSQ shared little variance with demographic variables except that NC subscales of SCSQ and FEIT had moderate negative correlation with age. Higher educational level was also associated with better performance in NC and FEIT. No correlations with illness duration were observed with all SC subscales. All subscales of SCSQ and FEIT did not have significant correlations with BPRS.

Table 8. Relationship between social-cognitive performance (C-FEIT & C-SCSQ) and demographic characteristics, cognition and psychopathology

Variables	FEIT	SCSQ subscales			
		ToM	JTC	PAS	NC
Demographic					
Age	-.32*	.04	-1.8	-.04	-.36**
Gender[a]	.04	.16	.10	-.15	.24
Years of education	.47**	.14	.19	-.05	.42**
Illness duration	-.15	.17	-.15	-.20	-.14
Neurocognition					
TMT[1]	-.45**	-.25*	-.07	.22	-.40**
HVLT[2]	.22	.10	.02	-.12	.48**
VF[2]	.29*	.33**	-.04	-.34**	.32*
Clinical symptoms					
BPRS total [3]	-.10	-.13	-.18	.09	-.03
BPRS paranoid scale[3]	-.07	-.11	.08	.05	-.01

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

Note: FEIT: Facial Emotion Identification Test (measure of emotion perception), ToM: Theory-of-mind, JTC: Jump-to-conclusion, PAS: Paranoid attributional style, NC: Neurocognitive subscale of SCSQ, TMT: Trial Making Test A, HVLT: Hopskins Verbal Learning Test, VF: Verbal Fluency, BPRS: Brief Psychiatric Rating Scale, BPRS paranoid scale: item 6 (tension), item 10 (hostility), item 11 (suspiciousness), item 14 (uncooperativeness) and item 17 (excitement) of BPRS

[1] higher scores indicate worse performance, [2] higher scores indicate better performance, [3] higher scores indicate more symptomatology

4.3.2 Correlational analysis between NC and SC measures

Correlational analyses among the 5 social cognitive subscales and 3 neurocognitive subscales were first conducted (table 9). There is a wide range of correlations among the variables, ranging from |.01| to |.67|. JTC subscale showed minimal correlations with other scales. As expected, almost all SC subscales, except JTC, correlated with neurocognitive measures in expected directions. FEIT, NC and ToM subscales of SCSQ correlated with neurocognitive measures positively while PAS correlated in a negative direction. Neurocognitive measures had stronger correlations with FEIT and NC subscale of SCSQ, when compared with other measures.

Table 9. Correlations among SC and NC measures

Variables	FEIT	ToM	JTC	PAS	NC	TMT	HVLT
ToM	.28*						
JTC	-.03	-.27*					
PAS	-.27*	-.67***	.22*				
NC	.23*	-.01	.11	-.13			
TMT	-.49***	-.20	.09	.18	-.37**		
HVLT	.38**	.12	-.08	-.18	.47***	-.43***	
VF	.37**	.35*	-.06	-.34*	.31**	-.46***	.41***

** **p** < .05, ** **p** <.01, *** **p** <.001*

Note: FEIT: Facial Emotion Identification Test (measure of emotion perception), ToM: Theory-of-mind, JTC: Jump-to-conclusion, PAS: Paranoid attributional style, NC: Neurocognitive subscale of SCSQ, TMT: Trial Making Test A, HVLT: Hopkins Verbal Learning Test, VF: Verbal Fluency

4.3.3 Factor analysis

Factor analysis was conducted to examine how NC and SC may be related, as well as to reduce the number of variables for subsequent logistic regression. Since a number of studies showed that there is a large shared variance between NC and SC constructs (Couture, Granholm & Fish, 2011; Gard, Fisher, Garrett, Genevsky & Vinogradov, 2009; Schmidt, Mueller, & Roder, 2011,), the factor structure of SC and NC constructs obtained from FEIT, SCSQ and the set of neurocognitive assessments in this study was explored in a single factor analysis.

Preliminary analyses were conducted to assess the appropriateness of the correlation matrix for dimensional analysis. The KMO index of sampling adequacy was .73, Bartlett's Test of Sphericity was statistically significant ($\chi^2 = 121$, df = 28, $p < .0001$), and the determinant of the correlation matrix was non-zero. All indices indicated that the matrix was adequate (Tabachnick & Fidell, 2007). From the screeplot of changes in eigenvalue, extraction of either a 2-factor or 3-factor solution could be suitable. Both the 2-factor and 3-factor solutions explained a significant proportion of the variance, 57% and 68% respectively, and were clearly higher than that explained by 1-factor solution (37% variance). Table 10 presents the factor loadings of subscales in both 2-factor and 3-factor solutions. In the 2-factor solution, FEIT and NC together with all neurocognitive scales loaded on "factor 1" whereas ToM, PAS and JTC loaded on "factor 2". In the 3-factor solution, FEIT and all neurocognitive scales loaded on "factor 1", ToM, PAS and JTC loaded on "factor 2", NC subscale of SCSQ loaded on "factor 3". It is noteworthy that JTC had a loading of around .30, borderline in significance, in both solutions. The 2-factor model was used in subsequent analyses as NC was as expected and theorized to be loaded in "factor 1" and that the 2-factor solution generally resembles the distinct but related constructs of neurocognition and social cognition (Green et al., 2008; Green & Horan, 2010; Sergi et al., 2007b, Schmidt, Mueller & Roder, 2011). In subsequent analysis, Factor 1 would be labelled Neurocognitive factor consisting of subscale scores of TMT, VF, HVLT, NC subscale of SCSQ and FEIT, while Factor 2 would be labelled Social Cognitive factor consisting of ToM, PAS and JTC subscales of SCSQ.

Table 10. Factor loadings on C-FEIT, C-SCSQ, TMT, HVLT and VF derived from principal axis factor analysis

	Standardized Factor Loadings				
	2-Factor Solution		3-Factor Solution		
Variables	Factor 1	Factor 2	Factor 1	Factor 2	Factor 3
TMT	**-.70**	-2.6	**-.77**	-.25	-.42
HVLT	**.68**	.18	**.61**	.20	.56
VF	**.63**	.41	**.61**	.41	.42
FEIT	**.58**	.33	**.63**	.32	.31
NC	**.57**		.47		**.83**
ToM	.28	**.93**	.34	**.86**	
JTC		**-.30**		**-.29**	
PAS	-.33	**-.71**	-.33	**-.79**	-.22

Note: FEIT = Facial Emotion Identification Test (measure of emotion perception), ToM = Theory-of-mind, JTC: Jump-to-conclusion, PAS = Paranoid attributional style, NC = Neurocognitive subscale of SCSQ, TMT = Trial Making Test A, HVLT = Hopskins Verbal Learning Test, VF = Verbal Fluency;

The highest factor loading in each row is highlighted using bold text.

4.3.4 Logistic regression on predictors of work status

Logistic regressions were conducted to determine if the Neurocognitive (NC) factor (factor 1) and Social Cognitive (SC) factor (factor 2) predicted work status at 3-months (group 1 = competitively employed; group 2 = unemployed). Two models of logistic regression were conducted with Model 1 examined the simple association between NC factor and SC factor on the work status and Model 2 examined the association after adding psychiatric symptoms variable. Table 11 shows the result of logistic regression.

In model 1, NC factor (β = -.65, p = .05) was a significant predictor of work status. This factor remained to be the only significant predictor (β = -.89, p = .03) of work status after adding BPRS, yielding a prediction accuracy of 66.1 %. A third model was conducted to check if the factor which comprises neurocognitive measures only predicted work status. The "neurocognitive factor" was a marginally insignificant predictor (p = 0.06) in the model. This implied that the factor comprising of both emotion perception and neurocognitive variables, but not neurocognitive variable factor, predicted work status.

Table 11. Logistic Regression examining the predictors of employment status (N = 56)

	Model 1					Model 2				
	β	S.E.	Wald	df	p	β	S.E.	Wald	df	p
Variables										
Factor 1	-.649	.325	3.98	1	.046*	-.887	.417	4.52	1	.033*
Factor 2	-.133	.299	.20	1	.656	.407	.363	1.25	1	.263
BPRS						.013	.077	.029	1	.864

* ***p*** < *.05*

Note: Factor 1 + TMT, HVLT, VF, NC, FEIT; factor 2 = ToM, JTC, PAS; FEIT = Facial Emotion Identification Test (measure of emotion perception) , ToM = Theory-of-mind, JTC: Jump-to-conclusion, PAS = Paranoid attributional style, NC = Neurocognitive subscale of SCSQ, TMT = Trial Making Test A, HVLT = Hopskins Verbal Learning Test, VF = Verbal Fluency, BPRS = Brief Psychiatric Rating Scale

4.3.5 Relationships between work outcomes with neurocognitive, social cognitive clinical and demographic variables

Correlational analyses were used to examine if there is any relationships between social cognitive, neurocognitive, clinical and demographic variables, and work outcomes (salary and job tenure) at 3 months (Table 12). Of the 19 employed subjects at 3 months, their job tenure did not correlate with any of the variables whereas their salary was negatively correlated with duration of illness ($r = -.638$, $p = .003$).

Table 12: Relationships between social cognitive, neurocognitive, symptoms variables and work outcomes in competitive employment

Variables	EP	ToM	JTC	PAS	NC	TMTA	HVLT	VF	BPRS	Age	Years of education	Duration of illness
Job tenure at 3 months (N=19)	<.0001 p=.99	.27 p=.26	.36 p=.14	-.29 p=.22	.07 P=.77	-.22 p=.36	.05 p=.84	.23 p=.34	.09 p=.71	.10 p=.70	.02 p=.93	.28 p=.25
Salary at 3 months (N=19)	.22 p=.35	-.06 p=.81	-.18 p=.45	.41 p=.09	.27 p=.26	-.12 p=.63	.29 p=.23	-.31 p=.19	-.28 p=.25	-.45 p=.06	.33 p=.17	-.64** p=.003

*$p < 0.05$, **$p < 0.01$*

Note. Spearman's ρ was estimated. EP = Emotion Perception, ToM = Theory-of-mind subscale, JTC = Jump-to-conclusion, PAS = Paranoid attributional style, NC = Neurocognitive subscale of SCSQ, TMTA = Trial Making Test A, HVLT = Hopkins Verbal Learning Test, VF = Verbal Fluency, BPRS = Brief Psychiatric Rating Scale

Chapter V

DISCUSSION

5.1 Overview

This chapter presents the discussion based on the results of Stage I study and Stage II study. It begins with the discussion on the significance of study, followed by study implications and study limitations.

5.2 Social cognitive assessment battery

Based on the framework on evaluation of social cognition proposed in Literature Review, Stage I study validated a battery of two social cognitive assessments (the C-FEIT and the C-SCSQ) that provides a more comprehensive evaluation of social cognition. The validation study examines the psychometric properties of the two instruments including the content-related validity, test-retest reliability, the known-group validity (using a matched control design), and the predictive validity with indexes of work performance.

The results highlighted some strengths and limitations of C-FEIT and C-SCSQ as social cognitive measure in schizophrenia. The study results supported the use of the C-FEIT in measuring emotion perception (EP) ability in schizophrenia. First, the C-FEIT possesses good test-retest reliability. Second, C-FEIT could differentiate EP ability between schizophrenia and non-psychiatric control group, supporting its known-

group validity. The effect size for the difference was small to medium (d = .56), which was slightly lower than that in a previous meta-analysis (Kohler, Walker, Martin, Healey, & Moberg, 2010). In this review, effect sizes (d) in EP performance between outpatients and controls was .70) and it was 1.20 between in-patients and controls. The smaller effect size obtained in our study might be related to the relatively good mental state of the patient sample, as the sample excluded subjects who are undergoing in-patient psychiatric treatment or had a significant change in psychiatric medication within the last 30 days. Third, the strength and direction of correlations between C-FEIT score (EP) and ToM and PAS subscales of C-SCSQ supported the validity of the C-FEIT. These findings largely replicated previous findings that EP had a positive (but insignificant) correlation with ToM (r = .23). This correlation is within the range of .17 - .44 which was found in similar studies (Bell, Tsang, Greig & Bryson, 2009; Buck, Healey, Gagen, Roberts & Penn, 2016; Mancuso, Horan, Kern & Green, 2011). EP had negative correlation with PAS, -.28, which is slightly higher than -.16 in a previous study (Mancuso, Horan, Kern & Green, 2011).

The C-SCSQ also demonstrated several strengths in measuring intention-inferencing ability (representing theory-of-mind), jump-to-conclusion tendency and paranoid attributional style in schizophrenia population. First, the test-retest reliability of subscales of C-SCSQ was adequate to good. Second, all social cognitive subscales of C-SCSQ measuring ToM, JTC and PAS were rated as having satisfactory content relevance and representativeness by expert panel, supporting its content-related validity. Third, patients with schizophrenia had significantly different performance in ToM, PAS and NC subscales of C-SCSQ from matched control group. The effect sizes were large,

supporting the known-group validity of C-SCSQ. Fourth, the C-FEIT and C-SCSQ subscale showed inter-correlations with strength and direction that is similar to the result of previous studies (Bell, Tsang, Greig & Bryson, 2009; Mancuso, Horan, Kern & Green, 2011). ToM positively correlated with EP at .23, which is comparable to .17 to .27 (Bell, Tsang, Greig & Bryson, 2009; Mancuso, Horan, Kern & Green, 2011), but negatively correlated with PAS, -.49, which is higher than the result of previous study (Mancuso, Horan, Kern & Green, 2011). PAS negatively correlated with EP, -.28, which is slightly higher than the result of previous study (Mancuso, Horan, Kern & Green, 2011).

Lastly, the indicators of social cognition (C-FEIT score and C-SCSQ subscales) were significant linked to indicators of work performance (CWPP subscales) in a Structural Equation Model (SEM). The results imply that ToM and EP contribute positively to work performance while JTC, PAS, and neurocognitive measures are negatively associated with work performance. In particular, it is noted that the path coefficients linking ToM and PAS to social-cognitive abilities are high, which also implies that both ToM and PAS are the key dimensions of social-cognitive abilities in the SEM. These results are consistent with a previous meta-analysis which highlighted that ToM has the strong relationship with global measures of community functioning or specific measures of activities of daily living, social skills, vocational functioning, and quality of life (Fett, Viechtbauer, Penn & van Os, 2011). The adverse impact of PAS on vocational functioning is a relatively new finding.

The C-SCSQ has some limitations. First, there are some doubts on the content-related validity of the neurocognitive subscale. Some members of expert panel commented that the neurocognitive subscale assesses social knowledge and comprehension, which is beyond neurocognition. The neurocognitive subscales are designed to screen neurocognitive functioning by measuring verbal memory. Further evaluation would be needed to examine if some of the 20 questions assess the detection of low-level social cues on top of verbal memory (Kanie et al., 2014).

Second, the JTC subscale score of the control group is higher than the patient group. This result may reflect an issue in the scoring method of JTC score. JTC was calculated by the counting the degree of certainty in making incorrect answers in ToM subscale. As control group has significantly fewer number of incorrect answers for ToM items (on average 2-3 items), there may be an over-estimate of the JTC bias if they are also quite confident with these incorrect answers. Users need to take note of this potential issue in the interpretation of NC subscales in patient samples and JTC subscale among healthy controls.

5.3 Neurocognition and Social Cognition

There has been some discussion in the literature on whether neurocognition and social cognition are different or the same constructs. This study tried to address this question by examining the factor structure of the social cognitive assessment battery together with measures of neurocognition used in this study. In the satisfactory 2-factor solution, the first factor could be labelled as a Neurocognitive (NC) factor comprising of all

neurocognitive measures and FEIT score, while the second factor could be labelled as Social Cognitive (SC) factor comprising of the rest of SC domains of ToM, JTC and PAS. This 2-factor solution is largely consistent the common agreement that SC is a separate but related construct from NC (Green et al., 2008; Green & Horan, 2010). There is a need to try to replicate this finding and to further confirm the boundary between social cognition and neurocognition. In fact, some studies found that social cognition is an uni-dimensional structure (emotion and social perception) (Sergi et al., 2007b; Schmidt, Mueller & Roder, 2011) with close links with neurocognitive measures. In other studies, social cognition was found to be multifactorial in nature, supporting a 2-factor (EP and hostile attributional style) (Buck, Healey, Gagen, Roberts & Penn, 2016) or a 3-factor structure (EP, ToM, and attributional style) (Mancuso, Horan, Kern & Green, 2011).

The factor solution also found that emotion perception (measured by C-FEIT) loaded significantly on NC factor, instead of SC factor. This implies that emotion perception abilities may have stronger links to neurocognitive than social cognitive measures. The current findings supported that social cognitive abilities could be uni-dimensional, and EP could be grouped under neurocognition. The view that EP is a separate factor from other SC domains (e.g. ToM and AS) has in fact been suggested in some previous studies (Buck, Healey, Gagen, Roberts & Penn, 2016; Mancuso, Horan, Kern & Green, 2011). From a cognitive neuroscience perspective, emotion perception employs a brain network which is different from high-level mental state inference (ToM) (Kee, Kern & Green, 1998; Ochsner, 2008). This applies to both persons with schizophrenia and healthy controls. Taking the above discussion into consideration,

social cognition is likely to have a 2-factor structure which consists of EP, and another factor representing ToM, JTC, and PAS.

5.4 Social cognition as predictor on work outcomes

The result of stage II study supported that the neurocognitive the factor, comprising of emotion perception and neurocognitive measures, could predict work status in logistic regression. However, social cognitive factor (comprising theory-of-mind, attributional style and jump-to-conclusion) did not predict work status (Fett, Viechtbauer, Penn & van Os, 2011; Pijenborg et al., 2009). Some researchers suggested that social cognition comprises of two parts. The first part, comprising of emotion perception and low-level theory-of-mind (detection of lies based on explicit information) would correlate significantly with measures of work functioning (Mancuso, Horan, Kern & Green (2011). The second part representing higher-level theory-of-mind tasks, such as the capacity to detect sarcasm through processing subtle information and social cues, would not correlate with measures of work functioning.

While social cognition did not predict work status, the results of Stage I study results does show that it had a substantial impact on work performance. The SEM results indicated that social cognition had a significant impact on work performance, indicated by a path coefficient of .41. Considering the result in Stage I and II, it could be concluded that social cognition impact on work performance but is not predictive on work outcome like work status, work hours, or earnings. Work and employment outcome such as success in gaining employment is subject to multiple internal and

external factors which could not be explained by neuro- or social cognition alone. Possible factors that influence employment outcome could include motivation for work, the receipt of social security payments, financial status, availability of job support, job skills and job market (Marwaha & Johnson, 2004; Tsang, Leung, Chung, Bell & Cheung, 2010; Bouwmans et al., 2015; Marwaha et al., 2007).

5.5 Study Implications

5.5.1 Theoretical framework of evaluation for social cognition

The study conducted a comprehensive literature review on the construct of social cognition and constructed a conceptual framework that summarized the complex inter-play among the social cognitive processes, neurocognition, positive and negative symptoms and work outcomes. This framework guides the systematic evaluation of social cognition in persons with schizophrenia. Social cognition can be conceptualized as comprising of four key elements, i.e. theory-of-mind, paranoid attributional style and jump-to-conclusion tendency. From the result of current literature, social cognition could have effect on work functioning, but it also mediates the relationship between neurocognition and work functioning.

5.5.2 Social cognitive assessment battery for use with Chinese populations

In Stage I of the study, Chinese version of the C-FEIT and C-SCSQ were developed and validated. The psychometric studies supported the reliability and validity of social

cognitive assessment battery for a comprehensive assessment of the key social cognitive domains, including emotion perception, theory-of-mind, paranoid attributional style and jump-to-conclusion tendency. Comprehensive social cognitive assessment battery that is applicable to Chinese persons with schizophrenia has been lacking. This battery is now ready for use in local clinical settings for assessment of social cognition and outcome measurement of social cognitive interventions. It can help clinicians to identify needs for social cognitive rehabilitation among persons with schizophrenia. Training on the use and administration of this battery has been shared with local occupational therapists in two training workshops in June 2014 and October 2014.

5.5.3 Multifactorial structure of social cognition

The result of factor analysis in stage II study echoes with preliminary findings of other studies that support multifactorial construct of social cognition (Buck, Healey, Gagen, Roberts & Penn, 2016; Mancuso, Horan, Kern & Green, 2011). The results of factor analysis suggest that social cognition had two factors. Emotion perception form a factor with neurocognitive measures, while the second factor covers other three domains of social cognition, theory-of-mind, attributional style and jump-to-conclusion. This observation could be explained using the cognitive neuroscience perspective. EP, which focuses on processing of emotion information, uses different brain networks from ToM. ToM requires intensive mental processing capabilities like inferring meaning of a social action by interpretation situational information (Ochsner, 2008).

The finding of this thesis also adds evidence in support of the multifactorial structure of social cognition. Future empirical research could try to replicate and confirm the factor structure of social cognition in relation to neurocognition using confirmatory factor analyses. This is a challenge at the moment as there are limited choice of social cognition assessment tools for detailed assessment of some SC constructs, such as attributional style and jump-to-conclusion.

5.5.4 Social cognition and work performance and work performance/outcome

The relationship between social cognition and work or functional outcomes were mixed in current literature. This study is one of the few that examined how far social cognition, neurocognition, and other clinical variables could predict work performance or work outcome. This study addressed the research gap that many previous studies also did not include a comprehensive evaluation of social cognition. The finding of this thesis supported that social cognition construct (composing of a more comprehensive social cognitive domains) had a significant impact on work performance in a cross-sectional study. It also found that emotion perception and neurocognition could predict work status at 3-months follow up. These findings add knowledge to the field on potential role of social cognition and neurocognition on work performance/outcome. The result, however, did not support that social cognition had substantial impact on work outcomes like work status or earnings.

There are several methodology issues that need to be addressed in future studies of social cognition and work outcomes. The first issue is related to sample size and

sampling. A larger sample size is needed for a more powerful analysis examining predictors of work outcomes using methods like logistic regression or structural equations modelling. In future study of work outcome, researchers can also consider recruiting a patient sample which is receiving vocational support/follow-up service. This could reduce drop-out from this kind of longitudinal follow-up study. The drop-out in this study is linked to the termination of vocational rehab service which usually ends after placement for 3-6 months. Nevertheless, follow-up analysis revealed that correlations between drop-out with baseline cognitive and social cognitive scores were very small and non-significant (r from -.17 to .11; p values from .20 to .97), suggesting the effect of drop-out on the result should be minimal. The researcher could also conduct face-to-face interviews with the patients in vocational support services, which would help to verify the work outcomes data. The second issue is related to the choice of indicators of work outcomes. While it is common to use work status and earnings as the key work outcome data, the distribution of these data are often highly skewed and not suitable for regression analysis. Researchers could consider capturing alternative work outcomes such as total work hours within a specified period, rating of work performance by job coaches or job supervisors, as well as performance-based measurement in work. This could probably provide more powerful statistical analysis methods like multiple regression or structural equation modeling.

5.6 Study Limitations

5.6.1 Limitations of validation study

First, the validation study did not attempt to collect convergent or concurrent validity, as there is a lack of a recognized Gold Standard instrument and alternative social cognition assessment tools that have a Chinese version. The current available assessment tools do not assess exactly the same domains of social cognition measured by the C-FEIT and C-SCSQ. The Faus pax tasks and Eyes Tasks measure some facets of ToM ability but could not provide a comprehensive evaluation of SC like the C-SCSQ. The MSCEIT is designed to measure aspects of emotion intelligence instead of facial emotion processing/perception that is measured by C-FEIT. In fact, this is the reason for this thesis to propose C-FEIT and C-SCSQ to bridge current practice gap in providing a more comprehensive assessment of social cognition in persons with schizophrenia.

The second limitation is related to the measure used to assess work performance. CWPP is rated by clinicians based on direct observation of patients' functional performance in simulated work setting. Despite the strength of direct observation, performance-based measures are known to provide more direct and valid estimate of work performance (Harvey, Velligan & Bellack, 2007). In future studies, researchers could consider the use of performance-based measures instead of observational measures. The third limitation is the sample size for the analysis of relationship between social cognition and work functioning is small for modelling structural equations. Many references recommended that the sample required in SEM is 5 times number of variables. Thus the ideal sample size in the study is 50 as there are 10 variables in the analysis. The model fit in this study, however, was satisfactory using data from only 30

subjects. The SEM could be more powerful if we could recruit a larger number of subjects if time and resources allow.

5.6.2 Limitations of stage II study

There are several limitations in Stage II study. The first limitation is the sample size for logistic regression is small which may not be powerful enough to examine multiple predictors of work outcomes, including clinical symptoms, neurocognition, and social cognition. The second limitation is related to the choice of outcome. Work status is used as a primary indicator of work outcome, as work statuses do reflect functional level or disability. Successful employment, however, is subject to multiple environmental factors such as level of support, job market, apart from client's functional capacity (Brekke & Nakagami, 2010). In future studies, researchers could use performance-based measure of work capacity as indicator of work outcomes at follow-up on top of work status. Lastly, the recovery process of schizophrenia is non-linear, patients are subject to relapse in response to stressors or poor drug compliance. The study attempted to minimize the potential impact of mental condition effect by excluding subjects with recent psychiatric admissions or a major change in medication (change in the type of antipsychotic) in our analysis. It is recommended in future study to conduct clinical symptoms assessment at follow-ups to better address this issue.

Chapter VI

CONCLUSION

This study showed that an assessment battery consisting of C-FEIT and C-SCSQ could provide a comprehensive assessment of social cognition in Chinese persons with schizophrenia. The assessment battery demonstrated satisfactory to good reliability in this study. The factor analysis results suggested the construct of social cognition had two factors. The social cognition construct, as a whole, had a significant impact on work performance. In particular, a combination of emotion perception and neurocognition scores is effective in prediction of prospective work status. This study, however, did not support that social cognition impact on work outcomes directly. Future study should incorporate a sample with a larger sample size, with ongoing follow-up and should capture continuous data that reflect work outcomes.

Appendices

A. Information Sheet

參與研究資料書

研究項目: 精神分裂症康復者的社交認知評估研究

現在我們邀請你參與一項研究計劃。在你還沒有決定是否參與之前，請務必瞭解研究的目的及研究將涉及什麼。這份資料書詳述有關資訊，請仔細閱讀以下資料。如有必要，請你和你的家人及朋友討論。若你有任何疑問，或想知道更多的資料，請向負責這項研究的人員詢問，然後周詳考慮並決定是否參與。

是項研究旨在探討精神分裂症患者的社交認知功能（包括判斷表情的能力、理解他人想法的能力、歸因及下判斷的傾向）、基本認知功能(包括信息處理速度、記憶力及執行能力等)與病徵、社交及工作能力的關係。

若你決定參與此項研究，你將需要進行一份問卷及五項測試，會花閣下約兩小時。個別參與者會被邀請在此測試一星期後，重覆當中的一份問卷及一項測試，會花閣下約一小時。若你決定參與此項研究，你亦同意研究員會在三個月及半年後聯絡閣下或負責你職業治療師，進行一個簡短的電話訪問跟進工作進度。

所有在研究期間所收集有關你的個人資料會絕對保密及受到青山醫院現行的私隱規則監管。我們希望透過是項研究所獲得的資料以作學術

研究。這項研究所收集的資料對未來精神分裂症患者的治療將有所幫助。

此項計劃由現時起將於三年內完成，研究結果將有機會在學術研討會、專業刊物、公眾雜誌、互聯網或大眾傳播媒體上發佈。你的個人資料並不會在任何報告或刊物出現。

參與這項研究與否，完全是你個人的自願決定。若你決定參與，你要簽署一份同意書並可保存這份資料書。即使在你參加這研究後，你仍可在任何時候退出，而無需任何理由，你只需通知負責人。是項研究的目的、程序及研究操守均由醫院管理局新界西聯網研究審查委員會及香港理工大學的研究審查委員會所監察。如需要詳盡的資料，你可以聯絡這項計劃的負責人盧敏婷小姐。請致電 24567502 或發電郵 lmt628@ha.org.hk。

感謝你騰空細閱資料及考慮參與研究。

(Version 1, Prepared on 14/9/2012)

B. Consent Form

參與研究同意書

研究項目名稱：精神分裂症康復者的社交認知評估研究

研究員姓名：盧敏婷

		請在方框中加✓
1.	我已閱讀及明白這份參與研究資料書（14/9/2012），並且已經獲得提問的權利。	☐
2.	我明白我的參與完全出於自願並可以在任何時候退出，而無需任何理由。我的決定不會影響我所受到的醫療待遇和法律權利。	☐
3.	我明白此研究的有關人員會查閱我的醫療記錄，我同意授權有關人員查閱我的記錄。	☐
4.	我同意參與這項研究。	☐

參與研究病人/ 監護人姓名	日期	簽名
*見證人姓名（如適用）	與病人關係	簽名

*獲取同意者姓名 (如不是研究人員)	日期	簽名
研究人員姓名	日期	簽名

如有任何有關這項研究的問題, 請致電 2456　　與盧敏婷小姐聯絡。

副本致:

- 參與研究病人/監護人
- 研究人員檔案

(Version 1, Prepared on 14/9/2012)

C. Rating questionnaire for expert panel review

Rating Scale for Expert Panel

Validation Study on Chinese-version Social Cognition Screening Questionnaire (C-SCSQ)

Please tick (✓) in the box under your choice.

Part A: Translation

1 How far do you agree that the Chinese translation is semantic equivalent to the original English version?

Strongly Disagree	Disagree	Agree	Strongly Agree

Comment (if any): _____

2 How far do you agree that the Chinese translation is fluent?

Strongly Disagree	Disagree	Agree	Strongly Agree

Comment (if any): _____

3 How far do you agree that the Chinese translated version is clear in presentation?

Strongly Disagree	Disagree	Agree	Strongly Agree

Comment (if any): _____

Part B: Cultural Relevance

4	To what extent, do you agree that the content of this questionnaire is relevant to Hong Kong culture? Strongly Disagree | Disagree | Agree | Strongly Agree Please comment and suggest modifications required to address issues of cultural relevance: _____ _____
5	To what extent, do you agree the suggested modifications in vignette 3? (i.e. replace *"spaghetti and tomato sauce"* with*: "炒飯"* and *"pizza"* with *"湯麵"*). Strongly Disagree | Disagree | Agree | Strongly Agree Or write down your suggestion: _____
6	To what extent, do you agree the suggested modifications in vignette 8? (i.e. replace *"Bingo Game"* with "*到博物館看展覽"*) Strongly Disagree | Disagree | Agree | Strongly Agree Or write down your suggestion: _____
7	To what extent, do you agree the suggested modifications in vignette 8? (i.e. replace *"Susan/Stan"* with *"美玲／偉文*"). Strongly Disagree | Disagree | Agree | Strongly Agree Or write down your suggestion: _____
8	To what extent, do you agree the suggested modifications in vignette 9? (i.e. change *"do you live out in the country?"* to "*你家附近是否只有一間咖啡店？"* Strongly Disagree | Disagree | Agree | Strongly Agree Or write down your suggestion: _____
Part C: Content Validity	

9a	To what extent, do you agree that questions A & B are relevant in assessing memory functioning in each vignette:

Vignette 1 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 1 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 2 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 2 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 3 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 3 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 4 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 4 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 5 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 5 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 6 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 6 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 7 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 7(B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 8 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 8 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 9 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 9 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 10 (A)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 10 (B)

Strongly Disagree	Disagree	Agree	Strongly Agree

<table>
<tr><td>9b</td><td>How far do you agree the vignettes as a whole is representative of scenarios for assessing memory functioning?

<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>10a</td><td>To what extent, do you agree that questions C are relevant in assessing theory-of-mind (ToM) ability in each vignette:

<u>Vignette 1 (C)</u>
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
<u>Vignette 2 (C)</u>
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
<u>Vignette 3 (C)</u>
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
<u>Vignette 4 (C)</u>
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
<u>Vignette 5 (C)</u>
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
<u>Vignette 6 (C)</u>
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
<u>Vignette 7 (C)</u>
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
<u>Vignette 8 (C)</u>
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table></td></tr>
</table>

<table>
<tr><td></td><td>Vignette 9 (C)
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
Vignette 10 (C)
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>10 b</td><td>How far do you agree the vignettes as a whole is representative of scenario for assessing ToM?
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>11 a</td><td>To what extent, do you agree that questions D are relevant in assessing jump-to-conclusion (JTC) in each vignette:

Vignette 1 (D)
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
Vignette 2 (D)
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
Vignette 3 (D)
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
Vignette 4 (D)
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
Vignette 5 (D)
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
Vignette 6 (D)
<table><tr><th>Strongly Disagree</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>
Vignette 7 (D)
<table><tr><th>Strongly</th><th>Disagree</th><th>Agree</th><th>Strongly Agree</th></tr></table></td></tr>
</table>

		Disagree			

Vignette 8 (D)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 9 (D)

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 10 (D)

Strongly Disagree	Disagree	Agree	Strongly Agree

11 b How far do you agree the vignettes as a whole is representative of scenarios for assessing jump-to-conclusion tendency?

Strongly Disagree	Disagree	Agree	Strongly Agree

12 a To what extent, do you agree that questions C in vignette 2, 3, 5, 6, 9 are relevant in assessing hostile attributional bias when they are answered incorrectly?
i.e. Incorrect responses in these items reflect the participants' tendency to endorses negative self-directed thoughts or feelings

Vignette 2 (C) <incorrect response: YES>

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 3 (C) <incorrect response: YES>

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 5 (C) <incorrect response: YES>

Strongly Disagree	Disagree	Agree	Strongly Agree

Vignette 6 (C) <incorrect response: NO>

Strongly Disagree	Disagree	Agree	Strongly Agree

	Vignette 9 (C) <incorrect response: YES> Strongly Disagree | Disagree | Agree | Strongly Agree | | | |
12 b	How far do you agree the vignettes as a whole is representative of scenarios for assessing paranoid attributional bias? Strongly Disagree | Disagree | Agree | Strongly Agree | | | |
Part D: Others	
13	Please write down any other comments or suggestions: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
Demographics of Expert Panel	
	Please fill in the below data for record. Name: _____ Rank: _____ Years of experience in psychiatric field: _____ Any experience in conducting research in social cognition/neurocognition field: _____(Y/N), if yes, please write down years of experience and research area: _____ _____

Thank you

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