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Understanding sex differences in cognitive insight across first-and-multiple episode psychosis

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Abstract

Objective: Cognitive insight represents the capacity to self-reflect and consider external feedback when re-evaluating faulty beliefs. It is associated with specific cognitive capacities such as verbal memory, of which there is substantial evidence for sex differences in psychotic disorders. Like more general cognitive capacities, cognitive insight might too be modulated by sex differences.

Method: One hundred and seventy-one first episode psychosis (FEP; 123 males, 48 females), and 203 multiple episode psychosis (MEP; 147 males, 56 females) participants completed the Beck Cognitive Insight Scale (BCIS). A two-way MANOVA was conducted on the three BCIS measures (self-reflectiveness, self-certainty, composite index) with sex (male, female) and illness stage (FEP, MEP) as factors, followed by two-way ANOVAs and a post hoc test of simple effects.

Results: The only significant interaction to emerge was between sex and illness stage in self-certainty ($F(1, 373) = 5.88, p = .016$). A test of simple effects revealed that self-certainty group means were significantly different for males and females in FEP, where females had lower self-certainty than males ($p = .053$) but not during MEP ($p = .119$).

Conclusion: Sex differences do not modulate cognitive insight in MEP, which may be attributable to females having greater positive symptom severity than males. In FEP however, results revealed that females were significantly less self-certain than males. Lower self-certainty relative to self-reflectiveness predicts treatment response in psychological interventions, and as such future FEP studies should explore sex differences in psychological interventions.

Keywords: BCIS; insight; self-certainty; psychosis; schizophrenia; sex differences

1. Introduction

Sex differences are increasingly recognized in psychotic disorders. Differences have been observed specifically in brain development and cognition, illness incidence, clinical presentation and symptom severity, comorbidity, illness course, and age of onset (2010; Grossman et al., 2008; Leung and Chue, 2000; McGrath et al., 2004). These factors are generally known to contribute to poorer clinical and functional outcomes in men with enduring psychosis (Angermeyer et al., 1990; Grossman et al., 2008; Usall et al., 2003), though recent work suggests sex differences in such outcomes following early intervention for a first episode of psychosis (FEP) may not persist after controlling for other risk factors (ex: age, premorbid functioning) (Dama et al., in press).

There are mixed findings regarding whether sex differences exist, influence, or moderate other core features of the illness, notably with respect to clinical insight or illness awareness. Some research suggests that women present with better clinical insight (Cotton et al., 2009; Donohoe et al., 2009; Grossman et al., 2008) while other studies did not observe differences (Spitz et al., 2017). Less is known regarding whether sex differences exist in cognitive insight, a complementary and contributing factor to clinical insight, but which relies on the metacognitive processes that enable illness awareness (Beck and Warman, 2004). Indeed, a recent systematic review concluded that most studies have found an association between the two constructs (Van Camp et al., 2017).

Cognitive insight, typically impaired in psychotic disorders, speaks to one's capacity for mental flexibility and represents the ability to reflect on and criticize the validity of one's thoughts, to recognize when thoughts may be inaccurate, and to then rely on external feedback to make correct assessments (Beck et al., 2004). The construct is generally assessed using the Beck

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Cognitive Insight Scale (BCIS) (Beck et al.), which consists of two subscales measuring self-reflectiveness (openness to feedback) and self-certainty (degree of overconfidence) and a composite index (self-reflectiveness - self-certainty). Higher self-reflectiveness relative to self-certainty indicates greater cognitive insight, which predicts symptoms reduction and better treatment response in psychotherapy (Granhölm et al., 2005; Perivoliotis et al., 2010; Premkumar et al., 2011) and cognitive remediation (Benoit et al., 2016).

Sex differences in cognitive insight have not been extensively researched; to our knowledge, the only authors to have investigated potential differences were Kao et al. (2013), whose results indicated no significant sex differences in enduring schizophrenia, or multiple episode psychosis (MEP). However, there are robust findings for sex differences in cognitive capacities with a known relationship to cognitive insight, notably in verbal learning and memory (VM). Females with a FEP tend toward superior VM (Albus et al., 1997; Hoff et al., 1998; Ittig et al., 2015) as do those prone to MEP (Bozikas et al., 2010; Fiszdon et al., 2003; Goldstein et al., 1998; Hoff et al., 1998; Sota and Heinrichs, 2003; Vaskinn et al., 2011; Zhang et al., 2017), in all but three studies (Ayessa-Arriola et al., 2014; Goldberg et al., 1995; Lewine et al., 1996).

To expand upon this relationship, we previously identified an association between VM and cognitive insight using a subsample of the FEP participants included in the current study. We observed that deficits in VM were related to increased self-certainty (Lepage et al., 2008), which were then attenuated by a positive association between VM and self-reflectiveness following a small sample size increase ($n=10$) (Buchy et al., 2009). Engh et al. (2011) then replicated results from our first study (Lepage et al.) in a short illness duration sample. This association has not been replicated in MEP studies (Cooke et al., 2010; Garcia et al., 2012), except by Orfei et al. (2010), whose sample varied considerably in illness duration ($SD \pm 12$ years).

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Considering that VM is typically superior in females and is a known correlate of cognitive insight in FEP, it is conceivable that sex differences might also modulate cognitive insight, with differences potentially limited to this earlier illness stage. Our primary objective is to thus identify whether sex differences exist in cognitive insight in FEP and MEP. We chose to investigate FEP and MEP independently due to (1) Kao et al.'s previous null results in MEP; (2) the association between VM and cognitive insight appearing limited to FEP and shorter illness duration (Buchy et al., 2009; Engh et al., 2011; Lepage et al., 2008), and (3) illness stage having been found to either influence (Frangou et al., 2007; Øie et al., 2008) or moderate (Gerretsen et al., 2014; Quee et al., 2010) the relationship between neurocognition and other facets of insight.

Per responses on the three BCIS measures (self-reflectiveness, self-certainty, composite index), we predict that (1) FEP females will score significantly lower on self-certainty than FEP males, which is based on the predominant observation for a negative association between VM and self-certainty, and in the rationale that females tend towards superior VM; (2) there will be a significant interaction effect for sex and illness stage, such that sex differences will be greater in the FEP group as compared to the MEP group. Analyses regarding potential sex differences on the BCIS self-reflectiveness or composite index measures in FEP are exploratory. Further to testing these hypotheses, exploratory analysis will be conducted to examine the relationship between the BCIS scales and sex, age, IQ and verbal memory. Finally, given that some research suggests that individuals with active delusions tend to endorse higher self-certainty scores (Bora et al., 2007; Pedrelli et al., 2004; Warman et al., 2007), we will thus control for levels of positive symptomatology per the Scale to Assess Positive Symptoms (Andreasen, 1984b).

2. Method

2.1 Participants and design

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Data from the present cross-sectional study were collected from several research studies conducted at our laboratory investigating psychosis in FEP and MEP and were combined for secondary analysis. A total of 171 FEP participants (123 males, 48 females) were referred and / or recruited from the Prevention and Early Intervention Program for Psychoses clinic, an early intervention service of the Douglas Mental Health University Institute (DMHUI) located in Montreal, Quebec, Canada (PEPP-Montreal) (see Iyer et al., 2015). FEP participants ranged in age from 18 to 35 years; the average length of follow up at PEPP-Montreal prior to participation was 5.8 months. A total of 203 (147 males, 56 females) MEP participants were referred and / or recruited from various in-patient units and other outpatient clinics of the DMHUI and ranged in age from 21 to 59 years. All MEP participants had been receiving ongoing psychiatric treatment for ≥ 4 years, and the average length of follow up prior to participation was 13.2 years. Finally, analyses were also run using a healthy control sample; results are presented in supplementary data. Readers are invited to see Penney et al. (2018) for detailed sample characteristics of the healthy control sample.

Written informed consent was provided by all participants in a manner respecting the DMHUI's research ethics board policies for ethical approval. All participants were diagnosed with a schizophrenia spectrum disorder per the Structured Clinical Interview for DSM-IV or DSM-5 (First et al., 1997; First, 2014). Diagnoses were confirmed via medical chart review. Eligibility included (1) having previously participated in a research study conducted at our laboratory and (2) fluency in French or English. Exclusions included (1) affective psychosis; (2) substance dependency; (3) an IQ below 70; and (4) neurological disorder. FEP and MEP participants were included in the current analyses if they met the above criteria and had completed the BCIS as part of a comprehensive symptom evaluation administered by a trained

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research assistant. Further information regarding any of our research projects can be obtained by contacting the corresponding author.

2.2 Sex and demographic measures

Biological sex, age, language, and years of education were obtained from participants' self-report. Illness duration was calculated in years and was based on the difference between the date of study participation and entry into the PEPP-Montreal program for FEP, and either first reported psychotic symptoms or first hospitalization for MEP. Family socio-economic status was calculated using the Hollingshead two-factor index of social position (Hollingshead, 1957).

2.3 Clinical and neurocognitive assessments

Clinical depression was assessed using the Calgary Depression Scale (Addington et al., 1990). Psychotic symptoms were assessed using the Scale for Assessment of Positive Symptoms (SAPS; Andreasen, 1984b) and the Scale to Assess Negative Symptoms (SANS; Andreasen, 1984a). Full-scale IQ was calculated using the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1997a) or an abbreviated version of the Wechsler Adult Intelligence Scale (Wechsler, 1997). Verbal learning and memory was calculated using either a composite score of the logical memory subtest of the Wechsler Memory Scale (Wechsler, 1997b) or the CogState Schizophrenia Battery, which assesses the same cognitive dimensions as assessed by the Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) Consensus Cognitive Battery (Pietrzak et al., 2009).

2.4 Cognitive insight

Cognitive insight was measured using the Beck Cognitive Insight Scale (Beck et al., 2004) which is a 15-item self-report rated on a four-point scale: 0 "do not agree" to 3 "agree completely" with composite index scores (self-reflectiveness - self-certainty) ranging from -18 to

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27. Clinical cutoff values for the composite index have been recently established: low cognitive insight is represented by scores of 3 and below; moderate ranges from 4 to 9, and scores of 10 and above are considered high (Penney et al., 2018). The BCIS has demonstrated reliability and validity for use in schizophrenia spectrum disorders (Beck et al., 2004; Favrod et al., 2008; Pedrelli et al., 2004). Only data from the first administration of the BCIS were included in the analyses.

2.5 Statistical analysis

Analyses were performed using SPSS version 25. Means, standard deviations, ranges, or percentages were calculated for all clinical, neurocognitive, and demographic variables, and the three BCIS measures (self-reflectiveness, self-certainty, composite index). Tests' assumptions were verified, alpha levels were set at .05, and tests were two-tailed for all analyses. Independent samples *t* tests were used in conjunction with Mann-Whitney *U* tests when variables were not normally distributed. Skewed variables were transformed into z-scores when appropriate. Chi-square tests of homogeneity of proportions tested for significant sample size and diagnostic differences between the FEP and MEP samples. Spearman correlations investigated whether relationships existed between the variables of interest, using Bonferroni correction. A two-way multivariate analysis of variance (MANOVA) was run on the three BCIS measures, with sex (male, female) and illness stage (FEP, MEP) as factors, followed by two-way analyses of variance (ANOVAs). Finally, a post-hoc test of simple effects was conducted to explore significant interactions.

3. Results

A total of 374 participants (FEP = 171, MEP = 203) were included in the analyses. **Table 1** presents means, standard deviations, ranges, or percentages for all variables. BCIS self-

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reflectiveness scores and the composite index were normally distributed. BCIS self-certainty scores were positively skewed and were transformed into z-scores. Results from the chi-square test of homogeneity of proportions indicated no significant difference among FEP and MEP sample sizes ($\chi^2(1) = 0.011, p = 1.000$). Analysis of the differences in schizophrenia spectrum diagnoses revealed no significant difference between males and females in the FEP group ($\chi^2(6) = 6,400, p = .383$). Results were significant for the MEP group ($\chi^2(4) = 17,665, p = .001$). There was no significant difference in spectrum diagnoses between females across illness stage ($\chi^2(5) = 9,409, p = .094$), whereas males did differ in spectrum diagnoses across illness stage ($\chi^2(6) = 24,184, p = .000$).

Mann-Whitney *U* tests revealed no significant differences in total global scores on the SAPS between FEP males (Mdn = 86.83) and females (Mdn = 83.86), $U = 2849.50, p = .732$, however MEP males (Mdn = 93.89) and females (Mdn = 123.29) did significantly differ on total global SAPS scores, $U = 2923.50, p = .001$. Further, results suggested significant differences in total global SAPS scores for male FEP (Mdn = 118.43) and male MEP (Mdn = 152.92) participants, $U = 6921.00, p = .000$ and for female FEP (Mdn = 38.35) and female MEP (Mdn = 64.63) participants, $U = 665.00, p = .000$. **Table 2** reports Spearman's correlations between the BCIS, clinical, neurocognitive, and demographic variables of interest.

A two-way MANOVA tested the effect of sex and illness stage on the dependent variables (self-reflectiveness, self-certainty, composite index). Results revealed a statistically significant interaction between sex and illness stage on the combined dependent variables ($F(3,368) = 3.165, p = .025$). ANOVA results suggested a significant interaction for the self-certainty subscale ($F(1, 370) = 6.116, p = .014$). A post-hoc test of simple effects decomposed the interaction as a function of illness stage, and revealed that self-certainty group means were

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significantly different for males and females in the FEP stage ($p = .053$), such that female FEP participants had lower self-certainty scores than FEP male participants, but not during the MEP stage ($p = .119$). No significant interaction of sex and illness stage emerged for the self-reflectiveness subscale ($F(1, 370) = .752, p = .386$) nor was the model significant for the composite index ($F(1,370) = .818, p = .366$). No significant main effects emerged for either sex or illness stage for self-reflectiveness, self-certainty, or the composite index (all p 's $> .145$). Finally, independent samples t test results for self-certainty scores suggested a trend-only difference between FEP and MEP females ($t(102) = -1.884, p = .062$), and no significant difference between FEP and MEP males ($t(268) = 1.582, p = .115$).

4. Discussion

4.1 Sex differences in cognitive insight during FEP and MEP illness stages

This study examined potential sex differences in cognitive insight during first episode of psychosis and among those prone to multiple episodes. Our results were in line with our primary hypotheses and suggest an important sex difference in self-certainty, such that females endorsed significantly lower self-certainty scores than males, however this observation was limited to the FEP stage. More specifically, there were no significant differences in cognitive insight among the males in our sample across illness stage, whereas MEP females reported greater self-certainty scores as compared to FEP, which ultimately resulted in no differences among males and females with MEP. Further, our results are consistent with those previously reported by Kao et al. (2013), wherein no significant sex differences were observed on the BCIS measures in a longer illness duration sample.

We also observed that MEP males and females were more symptomatic than those in the FEP stage, but no sex-specific difference in positive symptomology was observed in FEP. Our

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results additionally suggested that males and females in the MEP group differed significantly with respect to schizophrenia spectrum diagnosis, but no sex-specific differences were revealed in the FEP group. This is unsurprising given our FEP clinic provides services to the entire catchment area, thus covering the full spectrum of clinical presentation, whereas MEP participants are those still requiring mental health services. We did however find that MEP females were more symptomatic than MEP males, and notably, it was during the MEP stage where females exhibited the same degree of self-certainty as males. This result replicates previous observations that individuals with active delusions endorse higher self-certainty scores (Bora et al., 2007; Pedrelli et al., 2004; Warman et al., 2007), however these prior results were not sex-specific. Finally, while females did not differ across illness stage with respect to diagnosis, differences were observed among the males in our sample. As such, the change in self-certainty scores observed in females across illness stage was likely not a function of schizophrenia spectrum diagnosis.

Regarding positive symptomology, our results are only partially in line with previous evidence which suggests that both sexes typically exhibit the same degree of positive symptom severity. In some cases however, females exhibit more severe psychotic symptoms, or greater incidence of certain symptoms such as auditory hallucinations or persecutory delusions, which tend to occur more cyclically (see Leung and Chue, 2000). Nonetheless, the rationale to assess sex differences in cognitive insight in FEP was predicated on previous work identifying a negative relationship between self-certainty and VM (Engh et al., 2011; Lepage et al., 2008), and specifically because females typically exhibit superior VM (Albus et al., 1997; Bozikas et al., 2010; Fiszdon et al., 2003; Goldstein et al., 1998; Ittig et al., 2015; Sota and Heinrichs, 2003; Vaskinn et al., 2011; Zhang et al., 2017). It may be though, that males with a schizophrenia

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spectrum disorder might tend towards self-certainty more generally, regardless of illness stage, while females may become more self-certain with positive symptom exacerbation or due to the enduring presence of such symptoms over time.

Finally, to facilitate the broad clinical interpretation of these results, it is important to highlight that there was no evidence for sex differences across FEP and MEP in overall cognitive insight (scores on the composite index), nor with respect to self-reflectiveness. Composite index scores for men and women in both FEP and MEP samples fell within the moderate cognitive insight range (per Penney et al., 2018). This interesting finding suggests that overall cognitive insight may be relatively stable (albeit with moderate impairment) as the illness progresses, which should be more thoroughly explored longitudinally. As such, while self-certainty differed between sexes with respect to illness stage, participants' propensity to self-reflect about their psychotic experiences did not differ as a function of either sex or illness stage.

4.2 Correlates of interest

Our results as indicated in **Table 2** suggest a small negative association between self-certainty and VM, as well as a small positive association between VM and self-reflectiveness in the FEP illness stage group. It is thus likely that our first two studies lacked sufficient power to detect the relationship between VM and both BCIS subscales in FEP (Buchy et al., 2009; Lepage et al., 2008). The association between self-certainty and VM in FEP did not survive Bonferroni correction, though Bonferroni is arguably too stringent to apply solely for the purpose of controlling comparisonwise error rate (Bender and Lange, 2001). Further, there was no association observed between cognitive insight and VM in MEP, which is in line with previous findings (Cooke et al., 2010; Garcia et al., 2012). Finally, we did not observe an association between age and cognitive insight in either FEP or MEP. If these latter results are interpreted in

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the context of our main finding, which suggests that female participants may be less self-certain than males during a first episode of psychosis but not during the MEP stage, one could argue that this result is likely not a function of age, as the MEP group was also comprised of younger individuals.

4.3 Clinical implications

A fundamental goal of patient-centered medicine and thus patient-oriented research is to refine and facilitate the personalization of therapeutic services (Sacristán, 2013). Higher levels of cognitive insight have been positively associated with factors such as quality of life (Giusti et al., 2013; Phalen et al., 2015), and outcomes such as increased capacity for independent living (Favrod et al., 2008), and psychosocial functioning (O'Connor et al., 2013). Investigating possible nuances in cognitive insight, such as the relationship between sex differences and one's degree of mental flexibility and ability to incorporate feedback has important clinical implications, specifically during a FEP where cognitive inflexibility has been previously associated with risk of relapse (Chen et al., 2005). Females in the current study were less self-certain during FEP, thus clinicians may be sensitive to this potential difference, recognizing that female FEP clients may initially be more open to corrective feedback. Finally, given that overall cognitive insight was moderately impaired in both sexes and across illness stage, interventions aimed at improving cognitive insight are likely appropriate for all individuals with psychosis.

4.4 Limitations

The current study has some important limitations. There was a small number of female participants relative to males, in both FEP and MEP samples. While it would have been ideal from a statistical perspective to have equal male and female representation, our chi square test for the homogeneity of proportions was not significant, indicating no difference in the

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proportions between our two groups, thus facilitating their comparison. Another limitation

speaks to the sample's representativeness: while the current study included a large sample of males and females spanning both illness stages, our FEP group was comprised of all individuals, an unknown proportion of which will not transition to more enduring illness. Our MEP sample on the other hand, included only individuals still requiring psychiatric services. This is an inherent limitation in cross-sectional analyses when assessing differences across illness stage. A further limitation is that we did not include a measure of gender, or the participants' perception regarding the relationship between their biological sex and their sociocultural context. Some research suggests that individuals with a schizophrenia spectrum disorder may interpret gender roles differently (Sajatovic et al., 2005) than the general population. Future work should thus include measures of both sex and gender.

4.5 Conclusions

This study revealed that females were not as self-certain as males during a FEP. Interestingly, this sex difference in self-certainty was not observed in MEP, which may be attributable to MEP females presenting with more severe positive symptoms than MEP males. Lower self-certainty relative to self-reflectiveness predicts response to psychological treatment (Benoit et al., 2016; Perivoliotis et al., 2010; Premkumar et al., 2011), thus it would be interesting for future studies to investigate whether sex differences exist in response to psychological treatment in FEP.

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Table 1.

Demographic characteristics, clinical, neurocognitive, and cognitive insight measures

	FEP Females (N=48)			FEP Males (N=123)			MEP Females (N=56)			MEP Males (N=147)		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
Demographics												
Age	24.10	3.69	18-34	24.15	4.30	18-35	36.93	9.31	21-58	36.86	8.82	21-59
Years of Education	12.63	2.23	8-18	11.52	2.52	6-18	11.71	2.49	8-18	11.37	2.49	4-22
Full IQ	97.15	14.0	72-125	99.57	15.5	71-140	92.96	11.5	70-122	95.31	13.73	70-134
DOI	.44	.32	.0-1.6	.52	.73	.0-5	13.12	7.96	4-33	13.29	7.65	4-37
	n	%		n	%		n	%		n	%	
Family SES												
Lower	6	10.4		13	10.3		8	14.3		11	7.5	
Lower-middle	8	16.7		25	19.8		11	19.6		34	23.1	
Middle	17	35.4		39	31.0		10	17.9		48	32.7	
Upper-middle	10	20.8		18	14.3		8	14.3		18	12.2	
Upper	2	4.2		9	7.1		2	3.6		8	5.4	
Total n	42	87.5		104	82.5		39	69.6		119	81.0	
Diagnosis												
Schizophrenia	22	45.8		76	61.8		20	35.7		95	64.6	
Schizoaffective	11	22.9		18	14.6		21	37.5		26	17.7	
Delusional Dis.	0	0		3	2.4		0	0		1	0.7	
Schizophreniform	1	2.1		2	1.6		4	7.1		13	8.8	
Sub.-ind. Psychosis	1	2.1		1	0.8		0	0		0	0	
Psychosis NOS	11	22.9		17	13.8		6	10.7		5	3.6	
FEP	2	4.2		6	4.9		-	-		-	-	
Total N	48	100		123	100		56	91.1		140	95.2	
Antipsychotic												
Yes	43	89.6		110	87.3		51	91.1		133	90.5	
No	0	1.5		0	0		0	0		2	1.4	
Total n	43	89.6		110	87.3		51	91.1		135	91.8	

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	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
Clinical measures												
SAPS total	4.38	4.07	0-15	4.50	3.87	0-19	8.41	4.40	0-16	6.26	3.99	0-16
SANS total	7.46	3.86	0-16	8.31	3.65	0-17	9.34	3.34	2-18	9.73	3.19	0-17
CDS total	2.92	3.39	0-15	3.06	3.85	0-19	4.46	4.02	0-14	3.40	3.46	0-15
BCIS												
SR	12.27	3.96	4-21	12.87	4.36	3-23	13.45	5.26	2-26	13.17	4.09	1-23
SC	6.83	2.96	2-18	8.13	3.13	1-18	8.38	3.61	1-16	7.58	3.31	0-16
CI	5.44	5.25	11-19	4.74	5.95	10-19	5.07	7.02	10-22	5.59	5.35	10-20
Verbal memory	-.47	0.99	4-2	-1.25	1.12	4-1	-1.01	1.04	3-1	-1.85	1.18	5-1
Total n	46			120			38			121		

Note. FEP = first episode psychosis, (N=171); MEP = multiple episode psychosis, (N=203); Total (N=374); DOI = duration of psychotic illness in years; Family SES = family socioeconomic status; Diagnosis = schizophrenia spectrum disorders per the DSM-5; Sub.-ind. Psychosis = substance-induced psychosis; SAPS = Scale to Assess Positive Symptoms, total of four global items; SANS = Scale to Assess Negative Symptoms, total of four global items with attention excluded; CDS = the Calgary Depression Scale; BCIS = Beck Cognitive Insight Scale; SR = self-reflectiveness; SC = self-certainty; CI = composite index; verbal memory per the composite scores of the logical memory subtest of the Wechsler Memory Scale, or the CogState Schizophrenia Battery.

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Figure 1.

Figure 2.

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Figure 3.

Figures 1-3. Mean scores on the Beck Cognitive Insight Scale (self-reflectiveness, self-certainty, and composite index) for males and females. A two-way MANOVA tested the interaction of sex (male, female) and illness stage (first-episode psychosis, FEP; multiple episode psychosis, MEP) on the self-certainty, self-reflectiveness, and the composite index. Two-way ANOVAs revealed a significant interaction solely for self-certainty. * Indicates a significant interaction, $p = .014$.

Supplementary Table of Contents

- 1. Supplementary Results** - Independent samples t test comparing the scales of the Beck Cognitive Insight Scale in a healthy control sample.
- 2. Supplementary Table 1** - Means and standard deviations for the Beck Cognitive Insight Scale measures in healthy controls.

1. Supplementary Results

Independent samples *t* tests were conducted on the three Beck Cognitive Insight Scale (BCIS) measures to explore potential sex differences in a healthy control sample. Supplementary Table 1 reports means and standard deviations for the self-reflectiveness and self-certainty subscales, as well as for the composite index. Please see Penney et al. (2018) for detailed information on healthy control participant characteristics. Results indicated a statistically significant difference between males and females on the self-reflectiveness subscale ($t(146) = 3.236, p = .001$). There were no sex differences observed between men and women on self-certainty subscale ($t(146) = 1.069, p = .287$) scores nor on the composite index ($t(146) = 1.720, p = .088$).

Supplementary Table 1. Means and standard deviations for the Beck Cognitive Insight Scale measures in healthy controls

	Female Healthy Controls (N=49)			Male Healthy Controls (N=99)		
	Mean	SD	Range	Mean	SD	Range
Self-reflectiveness	9.41	3.19	2-16	11.30	3.43	4-20
Self-certainty	7.16	2.63	2-12	7.68	2.81	1-13
Composite index	2.24	4.323	0-12	3.63	4.73	0-16

Note: Total N=148

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Penney, D., Sauvé, G., Joobar, R., Malla, A.K., Lepage, M., 2018. Establishing Clinical Cutoff Values for the Beck Cognitive Insight Scale. *Cognitive Therapy and Research*, 1-11.