



## Self-stigma in psychotic disorders: Clinical, cognitive, and functional correlates in a diverse sample

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### ABSTRACT

Self-stigma in mental illness is linked to negative clinical and functional outcomes, but little is known about its correlates specifically in psychotic disorders. Here we investigated the role of clinical symptoms, cognition, and vocational status as correlates of self-stigma in 98 individuals with psychotic disorders (36 Black American, 32 White Hispanic, 11 White Non-Hispanic, 11 Asian American). A principal component analysis of the Internalized Stigma of Mental Illness scale yielded three components: Experiential Stigma, Stereotype Endorsement, and Stigma Resistance. Higher Experiential Stigma was associated with greater severity of affective symptoms and lower vocational status. Higher Stigma Resistance was associated with higher social and non-social cognition, and higher vocational status. Stereotype Endorsement did not significantly correlate with any predictor variable. Linear regression models showed that 13% of the variance in Experiential Stigma was explained by affective symptoms and vocational status, and 20% of the variance in Stigma Resistance was explained by non-social cognition and vocational status. These findings provide new information about the correlates of self-stigma in an ethnically and racially diverse psychotic disorder sample. Such information may lead to a better understanding of self-stigma mechanisms in this population.

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### 1. Introduction

It is widely held that individuals with mental health disorders face considerable public stigma (Link and Phelan, 2001). According to prevailing theories, some stigmatized individuals internalize and apply these negative attitudes and stereotypes to themselves, resulting in what has been defined as “self-stigma.” According to Corrigan and Rao (2012), self-stigma develops in progressive stages: Individuals become aware of public stigma, agree with negative stereotypes, and apply these stereotypes to themselves resulting in poorer self-esteem and self-efficacy. There is some evidence that the internalization of public stigma may be particularly pronounced in psychotic disorders (Jorm and Griffiths, 2008). For example, in a meta-analysis of 54 studies of schizophrenia spectrum disorders ( $n = 5871$ ), 64% endorsed anticipating or perceiving stigma in at least one domain of their life and 49% experienced alienation or shame around having a mental illness (Gerlinger et al., 2013).

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Self-stigma has been negatively associated with poorer psychological outcomes including lower self-esteem (Hofer et al., 2016), hope (Hofer et al., 2016), quality of life (Park et al., 2013; Picco et al., 2016), empowerment (Livingston and Boyd, 2010) and resilience (Hofer et al., 2019). Those experiencing self-stigma are more likely to use avoidance and social withdrawal as coping strategies further limiting successful integration into community life (Yanos et al., 2008). In addition, findings from the health services and psychiatric rehabilitation literature show that self-stigma is associated with greater unmet service needs (Livingston and Boyd, 2010), poorer treatment adherence (Livingston and Boyd, 2010; Yilmaz and Okanli, 2015), and poorer social and vocational functioning (Lysaker et al., 2007; Yanos et al., 2012).

Interventions for self-stigma in psychotic disorders have shown promising results (Wood et al., 2016). Understanding the mechanisms underlying self-stigma in this clinical population may help to improve existing interventions and develop new therapeutic strategies. Clinical findings show that self-stigma is associated with a greater severity of positive (Lysaker et al., 2007), negative (Hill and Startup, 2013), and depressive symptoms (Lagger et al., 2018; Park et al., 2013). Although cognitive deficits are a core feature of schizophrenia, only a few studies have explored the relationship between cognition and self-stigma. Better non-social cognition has been associated with lower self-stigma in a

Chinese sample (Chan et al., 2019). In an American sample of individuals with schizophrenia, those with poor attention were more likely to endorse self-stigmatizing beliefs (Lysaker et al., 2009). Relatedly, in a longitudinal study of individuals with schizophrenia, lower non-social cognition was associated with higher negative self-concepts twelve months later (Hesse et al., 2015).

Examination of the relationship between self-stigma and social cognition in psychotic samples is largely unexplored. We are aware of only one study to examine this question in schizophrenia (Galderisi et al., 2014). In that study, social cognition and self-stigma were mediators between non-social cognition and real-life functioning, and both variables did not significantly correlate with each other, although the direction of the correlation was negative. A recent study (Larsen et al., 2019) that evaluated individuals at clinical high risk for psychosis found that self-stigma-related shame was associated with facial fear recognition deficits. It is noteworthy that existing interventions for self-stigma involve cognitive restructuring and increasing perspective taking (Wood et al., 2016; Yanos et al., 2019).

The primary aim of the present study was to examine the clinical, cognitive (social and non-social), and functional (vocational status) correlates of self-stigma in a racially and ethnically diverse sample of individuals with psychotic disorders drawn from a large US metropolitan area. Based on the studies cited above, we hypothesized that higher levels of self-stigma would be correlated with greater severity of psychiatric symptoms, lower levels of non-social and social cognition, and lower vocational status.

## 2. Methods

### 2.1. Participants

One hundred and one participants were recruited from two sites: The VA Greater Los Angeles Healthcare System (56 participants) and the San Fernando Mental Health Center (45 participants). Participants were selected according to the following criteria: (1) diagnosed with schizophrenia, schizoaffective disorder, bipolar disorder with psychotic features, major depressive disorder with psychotic features, or other psychotic disorder (individuals diagnosed with substance-induced psychotic disorder or psychotic disorder due to another medical condition were excluded), as determined by available records and Structural Clinical Interview for DSM-5 (First et al., 2015); (2) age of 18 years or older; (3) clinical stability as defined by absence of inpatient hospitalization in the past three months and no changes in antipsychotic medication type in the past four weeks; (4) no moderate or severe substance or alcohol use disorder in the past three months, as per DSM-5; (5) no history of clinically relevant neurological disease or serious head injury with loss of consciousness for more than one hour, as determined by medical history; and (6) sufficient ability to understand written and spoken English. Three participants yielded invalid data on the primary outcome measure of self-stigma (see below), leading to a sample size of 98 for the analyses.

This study is a cross-sectional secondary analysis of a larger longitudinal study on vocational rehabilitation. The Institutional Review Boards at UCLA and VA Greater Los Angeles Healthcare System approved the protocol. All participants were evaluated for the capacity to give informed consent before providing written informed consent. Participants received financial compensation for their participation.

### 2.2. Measures

#### 2.2.1. Data quality assurance

Clinical symptom raters and diagnostic interviewers were trained according to standards established by the Treatment Unit of the Department of Veterans Affairs VISN 22 Mental Illness Research, Education, and Clinical Center (Ventura et al., 1993a, 1993b, 1998).

#### 2.2.2. Self-stigma

Self-stigma was assessed using the Internalized Stigma of Mental Illness scale (ISMI) (Ritscher et al., 2003), a 29-item self-report Likert scale assessing different aspects of self-stigma that participants rate from 1 (strongly disagree) to 4 (strongly agree). The ISMI is divided in five subscales: Alienation (6 items), Stereotype Endorsement (7 items), Discrimination Experience (5 items), Social Withdrawal (6 items), and Stigma Resistance (5 items).

#### 2.2.3. Demographic and work-related data

Demographic and clinical data included age, sex, education, race, ethnicity, disease duration, and current medication use. Vocational status in the past 12 months was categorized as: no useful work; volunteer or regular domestic work; supported or sheltered work with pay; employed for  $\frac{1}{4}$  of the year's working hours; employed for  $\frac{1}{2}$  of the year's working hours; employed for  $\frac{3}{4}$  of the year's working hours; and employed full-time continuously. The category of volunteer or regular domestic work was excluded because of its qualitative differences from sheltered or competitive work. The remaining categories were measured on an ordinal scale ranging from 0 (no useful work) to 5 (employed full-time continuously). Seven participants fell in the excluded category and were not included in the statistical analyses involving vocational status.

#### 2.2.4. Clinical symptoms

The 24-item expanded version of the Brief Psychiatric Rating Scale (BPRS) (Ventura et al., 1993a, 1993b) was used to assess psychiatric symptoms. The presence and severity of each symptom was assessed on a Likert scale from 1 (not present) to 7 (extremely severe). In the current study, we examined two subscale scores based on the factor structure by Kopelowicz et al. (2007): positive symptoms and affective symptoms. The Clinical Assessment Interview for Negative Symptoms (CAINS) (Kring et al., 2013) was used to assess negative symptoms in two domains: motivation and pleasure (9 items) and expression (4 items) (Horan et al., 2011). Each item is rated by an interviewer on a scale ranging from 0 to 4 with higher scores reflecting greater impairment during the previous week. The dependent measures were the motivation and pleasure and expression subscale scores.

#### 2.2.5. Non-social and social cognition

Non-social cognition was assessed by using selected tests from the MATRICS Consensus Cognitive Battery (Kern et al., 2008; Nuechterlein et al., 2008). A composite measure was obtained by averaging age- and gender-corrected T-scores from the following tests: Brief Assessment of Cognition in Schizophrenia - Symbol Coding (BACS-SC), Continuous Performance Test - Identical Pairs (CPT-IP), Hopkins Verbal Learning Test - Revised (HVLT-R), Letter-Number Span, and Neuropsychological Assessment Battery - Mazes subtest (NAB Mazes). These tests evaluate speed of processing, attention/vigilance, verbal learning, verbal working memory, and reasoning and problem solving, respectively.

Social cognition was assessed by using the Facial Emotion Perception Test (Ekman, 1976), Profile of Nonverbal Sensitivity (PONS) (Rosenthal et al., 1979), and The Awareness of Social Inference Test - Part 2 (McDonald et al., 2003), which assess emotion perception, social perception, and theory of mind, respectively. Z-scores were calculated based on the current sample for each test and averaged to create a composite score.

### 2.3. Data analysis

Data analyses were conducted using SPSS 26.0 (Chicago, Illinois, USA). Descriptive statistics were used to characterize the sample. Data reduction of ISMI items was accomplished by principal component analysis with promax rotation. Sampling adequacy was analyzed using the Kaiser-Meyer-Olkin test and Bartlett's test of sphericity. The number

of components extracted was defined based on consideration of the scree plot and eigenvalues. Component scores were estimated by Bartlett's method. All data were screened for normality of score distribution through histograms and indices of skewness. The distribution of Stereotype Endorsement component scores (see Section 3.2) was positively skewed. These data were subsequently transformed by taking the square root after summing the absolute value of the lowest component score in the sample (so negative values became greater than or equal to 0).

To identify meaningful predictors of self-stigma, we examined the association between component scores and clinical and cognitive variables using Pearson's bivariate correlation; the association between component scores and vocational status was assessed using Spearman's bivariate correlation. Follow-up multiple linear regressions were conducted to examine the amount of variance in self-stigma that was explained by the significant predictor variables. For each self-stigma component, the selected variables were entered in a single step using the simultaneous entry procedure. To balance the exploratory nature of the correlational analyses with the number of comparisons performed, we used a partially adjusted alpha level of 0.02.

### 3. Results

#### 3.1. Sample characteristics

Table 1 shows sociodemographic, clinical, cognitive, and functional (vocational status) characteristics of the sample. The racial/ethnic distribution of the sample was as follows: 36.7% Black, 32.7% White Hispanic, 11.2% White non-Hispanic, 11.2% Asian, and 8.2% other. Participants from the VA site had the following distribution: 61.8% Black, 12.7% White non-Hispanic, 10.9% White Hispanic, 5.5% Asian, and 9.1% others. The distribution at the San Fernando Mental Health Center site was 60.5% White Hispanic, 18.6% Asian, 9.3% White non-Hispanic, 4.6% Black, and 7.0% others.

#### 3.2. Principal component analysis of self-stigma

Sampling adequacy for the principal component analysis of the ISMI was satisfactory as indicated by a Bartlett's test of sphericity  $p$ -value < 0.0001 and a Kaiser-Meyer-Olkin statistic = 0.67. A solution with three components was defined based on eigenvalues and the scree plot (see Supplementary Fig. 1). The correlation matrix is presented in Supplementary Table 1; the structure matrix is presented in Table 2. All items of the Alienation, Discrimination Experience, and Social Withdrawal subscales had their highest loading on one component, which was labeled, "Experiential Stigma". All items of the Stereotype Endorsement subscale loaded highest on a second component, labeled, "Stereotype Endorsement." Lastly, all items of the Stigma Resistance subscale had their highest loading on a third component, labeled, "Stigma Resistance." Supplementary Table 2 shows component scores across racial/ethnic groups.

#### 3.3. Associations between variables of interest and self-stigma components

Table 3 presents correlations of component scores with clinical and cognitive variables and vocational status. Experiential Stigma component scores had a significant, positive correlation with BPRS affective symptoms as well as a significant, negative correlation with vocational status. The second component, Stereotype Endorsement, did not correlate significantly with any predictor variable, considering the adjusted alpha level. The third component, Stigma Resistance, showed a significant, positive correlation with the non-social cognition composite, the social cognition composite, and vocational status.

Follow-up multiple linear regressions yielded the following results for the amount of variance in self-stigma explained by the statistically significant predictor variables (Table 4). For Experiential Stigma, 13.3%

**Table 1**  
Demographic and clinical characteristics.

Variables	All participants (n = 98)	VA site (n = 55)	SFMHC site (n = 43)
Age	47.6 (13.2)	55.1 (9.6)	38.1 (10.9)
Male	79 (80.6%)	49 (89.1%)	30 (69.8%)
Education	12.9 (1.9)	13.0 (1.7)	12.8 (2.1)
Race			
White	43 (43.9%)	13 (23.6%)	30 (69.8%)
Black	36 (36.7%)	34 (61.8%)	2 (4.7%)
Asian	11 (11.2%)	3 (5.5%)	8 (18.6%)
Other	8 (8.2%)	5 (9.1%)	3 (7.0%)
Hispanic ethnicity	38 (38.8%)	10 (18.2%)	28 (65.1%)
Diagnosis			
Schizophrenia	69 (70.4%)	43 (78.2%)	26 (60.5%)
Schizoaffective disorder	14 (14.3%)	5 (9.1%)	9 (20.9%)
Bipolar or depressive disorder	12 (12.2%)	4 (7.3%)	8 (18.6%)
Other psychotic disorder	3 (3.1%)	3 (5.5%)	0 (0.0%)
Illness duration (years)	21.3 (12.5)	27.9 (11.7)	13.5 (8.2)
Antipsychotic medication			
Atypical	83 (84.7%)	48 (87.3%)	35 (81.4%)
Typical	5 (5.1%)	2 (3.6%)	3 (7.0%)
BPRS			
Positive symptoms	6.7 (3.0)	6.7 (3.4)	6.8 (2.6)
Affective symptoms	7.9 (3.1)	7.5 (3.2)	8.4 (3.0)
CAINS			
Motivation and pleasure	18.3 (8.6)	14.3 (7.5)	23.4 (7.1)
Expression	6.6 (5.5)	3.5 (3.9)	10.5 (4.7)
Non-social cognition (MCCB)			
BACS-SC	40.5 (12.0)	44.4 (9.4)	35.3 (13.2)
CPT-IP	39.5 (11.7)	40.9 (12.2)	37.6 (10.8)
HVLt-R	37.8 (8.7)	38.9 (9.5)	36.3 (7.4)
Letter-number span	37.8 (11.3)	47.6 (10.7)	35.2 (11.7)
NAB mazes	44.5 (10.6)	42.3 (10.0)	40.3 (10.2)
Composite score	40.2 (8.2)	42.3 (7.8)	37.2 (7.8)
Social cognition			
Facial emotion recognition	44.1 (6.4)	44.4 (6.4)	43.7 (6.4)
PONS	76.7 (8.4)	77.6 (7.2)	75.5 (9.8)
TASIT – part 2	44.5 (9.6)	45.6 (8.4)	42.9 (11.0)
Composite score	0.0 (0.7)	0.1 (0.7)	–0.1 (0.8)
Level of work in the past 12 months			
No useful work	46 (46.9%)	26 (47.3%)	20 (46.5%)
Supported or sheltered work with pay	4 (4.1%)	4 (7.3%)	0 (0.0%)
Employed for ¼ of the year	11 (11.2%)	3 (5.5%)	8 (18.6%)
Employed for ½ of the year	8 (8.2%)	6 (10.9%)	2 (4.7%)
Employed for ¾ of the year	7 (7.1%)	3 (5.5%)	4 (9.3%)
Employed full-time continuously	15 (15.3%)	10 (18.2%)	5 (11.6%)

Note. Data are shown as mean (SD) or n (percentage). CAINS = Clinical Assessment Interview for Negative Symptoms; MCCB = MATRICS Consensus Cognitive Battery; BPRS = Brief Psychiatric Rating Scale; TASIT = The Awareness of Social Inference Test; PONS = Profile of Nonverbal Sensitivity.

of the variance was explained by BPRS affective symptoms and vocational status. For Stigma Resistance, 20.1% of the variance was explained by the combination of non-social cognition, social cognition, and vocational status; however, the amount of variance explained in the model by social cognition was negligible.

### 4. Discussion

The present study investigated the role of clinical, cognitive, and functional correlates of self-stigma in a diverse, urban sample of individuals with psychotic disorders. Self-stigma data from the ISMI were reduced by means of a principal component analysis which yielded three components: Experiential Stigma, Stereotype Endorsement, and Stigma Resistance. Higher levels of Experiential Stigma were associated with greater severity of affective symptoms and lower vocational status. Higher levels of Stigma Resistance were associated with higher levels of non-social cognition and social cognition and higher vocational status. Stereotype Endorsement was not significantly associated with any variable of interest. Results from follow-up regression analyses revealed that the respective statistically significant predictor variables accounted

**Table 2**  
Structure matrix of ISMI principal component analysis.

Subscales	Items	Component 1 Experiential stigma	Component 2 Stereotype endorsement	Component 3 Stigma resistance
Alienation	1. I feel out of place in the world	<b>0.68</b>	0.40	0.00
	5. I am embarrassed or ashamed	<b>0.64</b>	0.39	−0.06
	8. I feel inferior to others	<b>0.59</b>	0.32	−0.03
	16. I am disappointed in myself	<b>0.60</b>	0.48	−0.05
	17. Having a mental illness has spoiled my life	<b>0.65</b>	0.63	−0.22
Stereotype endorsement	21. People without mental illness could not understand me	<b>0.51</b>	0.38	0.10
	2. Mentally ill people tend to be violent	0.34	<b>0.67</b>	0.01
	6. Mentally ill people shouldn't get married	0.39	<b>0.82</b>	−0.13
	10. Cannot live a good, rewarding life	0.56	<b>0.72</b>	−0.07
	18. People can tell that I have a mental illness	0.54	<b>0.57</b>	−0.17
	19. I need others to make most decisions	0.45	<b>0.63</b>	0.05
	23. I can't contribute anything to society	0.59	<b>0.75</b>	−0.29
Discrimination experience	29. Stereotypes about the mentally ill apply to me	0.55	<b>0.68</b>	−0.05
	3. People discriminate against me	<b>0.73</b>	0.46	0.03
	15. People often patronize me	<b>0.70</b>	0.40	−0.06
	22. People ignore me or take me less seriously	<b>0.72</b>	0.48	−0.08
	25. Nobody would be interested in getting close to me	<b>0.62</b>	0.47	−0.22
Social withdrawal	28. Others think that I can't achieve much in life	<b>0.69</b>	0.49	0.01
	4. I avoid getting close to people without a mental illness	<b>0.70</b>	0.38	−0.28
	9. I don't socialize as much as I used to	<b>0.75</b>	0.39	−0.03
	11. I don't talk about myself much	<b>0.62</b>	0.37	0.14
	12. Negative stereotypes against people with mental illness	<b>0.77</b>	0.51	−0.11
Stigma resistance	13. Being around people who don't have a mental illness	<b>0.69</b>	0.37	−0.13
	20. I stay away from social situations	<b>0.65</b>	0.54	−0.20
	7. Important contributions to society	0.00	−0.12	<b>0.86</b>
	14. I feel comfortable being seen in public	0.08	0.14	<b>0.45</b>
	24. Mental illness has made me a tough survivor	0.04	−0.18	<b>0.74</b>
	26. I am able to live life the way I want to	−0.18	−0.13	<b>0.81</b>
	27. I can have a good, fulfilling life	−0.11	−0.04	<b>0.86</b>

Note. The highest component loading of each item is shown in bold type.

for approximately 13% of the variance in Experiential Stigma and 20% of the variance in Stigma Resistance.

The association between Experiential Stigma and affective symptoms found in the present study is consistent with the body of research linking depression to self-stigma in individuals with schizophrenia spectrum disorders (Gerlinger et al., 2013; Lagger et al., 2018; Ritscher et al., 2003). While some stage models based on cross-sectional data suggest that self-stigma plays a causal role in the development of depressive symptoms, reduced self-efficacy and community functioning (Corrigan and Rao, 2012; Sibitz et al., 2011), the small number of longitudinal studies suggest a more dynamic, and perhaps bidirectional, relationship (Ben-Zeev et al., 2012; Lagger et al., 2018). For example, a study conducting ecological momentary assessment using mobile technology revealed that self-stigma significantly fluctuated over time, and that increases in preceding negative affect predicted increases in self-stigma (Ben-Zeev et al., 2012). The mechanisms by which depressive

symptoms could lead to self-stigma are not well understood, but it has been suggested that negative cognitive schemas might contribute to this process (Lagger et al., 2018). The lack of significant correlations between self-stigma components and positive and negative symptoms in our sample is noteworthy, considering that meta-analyses have linked greater symptom severity with higher internalized stigma and lower stigma resistance (Firmin et al., 2016; Livingston and Boyd, 2010). The reasons for the discrepancy may be related to the sample characteristics. For example, sociodemographic factors such as age, education and race can moderate associations between stigma resistance and clinical symptoms (Firmin et al., 2016).

Our finding that self-stigma is inversely associated with vocational status and are in line with previous research linking self-stigma to impaired community functioning. The association between self-stigma and community functioning has been studied primarily within the context of self-report quality of life measures (Firmin et al., 2016; Livingston and Boyd, 2010), with fewer investigations involving objective outcome measures (e.g., vocational status). Some studies' findings suggest that anticipated discrimination and self-stigma act as barriers

**Table 3**  
Correlations between ISMI component scores and clinical, cognitive, and functional variables.

Variables	n	Experiential stigma component		Stereotype endorsement component		Stigma resistance component	
		r	p	r	p	r	p
BPRS							
Positive symptoms	97	0.11	0.276	−0.03	0.763	−0.10	0.355
Affective symptoms	98	0.30	<b>0.003</b>	0.20	0.054	0.03	0.797
CAINS							
Motivation and pleasure	98	0.14	0.178	0.13	0.197	−0.16	0.111
Expression	98	0.17	0.102	0.12	0.231	−0.09	0.383
Non-social cognition composite score	89	−0.13	0.223	−0.22	0.040	0.33	<b>0.002</b>
Social cognition composite score	89	−0.06	0.568	−0.16	0.139	0.27	<b>0.011</b>
Vocational status	91	−0.25	<b>0.018</b>	−0.04	0.711	0.31	<b>0.003</b>

Note. P-values < 0.02 are in bold type.

**Table 4**  
Results from the linear regressions examining the amount of variance in self-stigma explained by selected predictor variables.

Variables	Standardized coefficient	p	VIF	Tolerance	n	R <sup>2</sup>
Outcome: Experiential stigma component						
Overall model					91	0.13
BPRS affective symptoms	0.29	<b>0.005</b>	1.01	0.99		
Vocational status	−0.25	<b>0.013</b>	1.01	0.99		
Outcome: Stigma resistance component						
Overall model					79	0.20
Non-social cognition	0.32	<b>0.010</b>	1.40	0.72		
Social cognition	0.02	0.881	1.40	0.71		
Vocational status	0.25	<b>0.018</b>	1.04	0.97		

Note. P-values < 0.05 are in bold type.

to vocational recovery in schizophrenia (Thornicroft et al., 2009; Yanos et al., 2010), whereas others suggest that increasing work productivity may serve a therapeutic function and decrease self-stigma. For example, one study showed a decrease in self-stigma after enrollment in supported employment (Rüsch et al., 2014). Another study reported reduction in self-stigma after enrolling in a vocational program as well as an increase in self-esteem in the subgroup of participants with a 25% or greater improvement in self-stigma from baseline (Lysaker et al., 2012).

Self-stigma models have largely focused on psychiatric and psychosocial factors as well as complex psychological constructs such as self-esteem, self-efficacy, hope and empowerment, with few studies examining the role of cognition. Our findings showed that higher levels of non-social cognition were specifically associated with Stigma Resistance. As suggested by Chan et al. (2019), better non-social cognition might help one's ability to counteract the internalization of public stigma. Given that perspective-taking is part of social cognition, we hypothesized that better social cognition would have a significant relationship with self-stigma. For example, better social cognition could lead to a greater ability to discount or entertain multiple different viewpoints without internalizing them. This idea is in line with the report of Nabors et al. (2014), who found that stigma resistance correlated with higher metacognitive capacity in persons with schizophrenia spectrum-disorders, suggesting that a greater ability to form an integrated and complex sense of self and others may lead to a greater capacity to reject public stigma. We found that higher levels of social cognition were associated with higher levels of Stigma Resistance, but it explained a negligible amount of variance in the follow-up regression analyses which included non-social cognition. This suggests that the role of social cognition on self-stigma is more limited when models include non-social cognition. A related finding was reported in a multivariate model of real-life functioning in schizophrenia (Galderisi et al., 2014). In that study, the model showed non-social cognition was associated with social cognition and internalized stigma, but social cognition was not associated with internalized stigma.

The ISMI is one of the most frequently employed measures of self-stigma and was developed with consideration of its ecological validity. The internal structure of the ISMI has been studied in different countries (Boyd et al., 2014); however, to the best of our knowledge, only two studies included U.S. samples, and one of those used an Arabic version of the ISMI in refugee participants (Kira et al., 2015; Ritsher et al., 2003). In most of these studies, factors or components were compatible or partially compatible with the original ISMI subscales. Of note, the majority of these studies did not focus on psychotic disorder samples. Although our aim in using principal component analysis was to reduce the total number of analyses performed, our results add to this literature by showing components partially compatible with ISMI subscales in a racially and ethnically diverse American psychotic disorder sample.

The study has several limitations. First, our sample was highly heterogeneous with respect to race and ethnicity without equal representation across groups. Hence, the findings could be driven by the overrepresentation of Black and White Hispanic participants compared to the other two groups (White Non-Hispanic, Asian Americans). Second, our sample size was relatively modest for a principal component analysis, possibly leading to the extraction of unstable components. However, this seems unlikely as the components Stereotype Endorsement and Stigma Resistance directly mapped onto the original ISMI subscales. Third, our measure of community functioning was limited to a single measure of vocational status. This type of measure is further limited in that it fails to take into account other key aspects of work which might be influential in the development or maintenance of self-stigma such as degree of interpersonal contact. Fourth, the cross-sectional nature of the study does not allow for conclusions to be drawn about causal directions nor stability over time. This is particularly relevant to the associations of self-stigma components with affective symptoms and vocational status. It could also be hypothesized that self-stigma affects cognition as stigmatized individuals are less willing

to interact with others and become socially isolated and lonely (Cacioppo and Hawkey, 2009).

In summary, the present study adds to the literature on self-stigma in psychosis by investigating the clinical, cognitive, and functional correlates of self-stigma in a racially and ethnically diverse sample of individuals with psychotic disorders. As far as we know, this is the first U.S.-based study to use a comprehensive cognitive evaluation to investigate the role of social and non-social cognition in self-stigma, and the first to demonstrate a relevant role of non-social cognition in stigma resistance. Our findings encourage future research to elucidate the relationships of self-stigma with affective symptoms and vocational status and other work outcome measures using longitudinal designs and more comprehensive assessments. Individuals with psychotic disorders with poorer cognitive functioning seem to represent a group particularly vulnerable to self-stigma and may require clinical and/or rehabilitative interventions to facilitate optimal levels of community functioning. A better understanding of the role of affective symptoms and fundamental cognitive functions is relevant to theory building and in the development of new rehabilitative interventions. Given the positive associations with cognition and vocational status, treatment research may also want to examine how to increase stigma resistance among individuals with psychosis.

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#### CRediT authorship contribution statement

Marcelo Schwarzbold: Formal Analysis, Writing – Original Draft Preparation, Visualization. Derek Novacek: Writing – Original Draft Preparation. Jessica McGovern: Writing – Original Draft Preparation. Lauren Catalano: Writing – Original Draft Preparation. Michael Green: Conceptualization, Resources, Writing – Reviewing and Editing. Robert Kern: Conceptualization, Resources, Methodology, Data Curation, Writing – Reviewing and Editing, Supervision.

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This work was funded by the National Institute of Mental Health. The funding source was not involved in study design, collection, analysis and interpretation of data, or writing of the manuscript.

#### Declaration of competing interest

The authors have no conflicts of interest to disclose.

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