



# Correlates of loneliness among persons with psychotic disorders

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## Abstract

**Introduction** Persons diagnosed with schizophrenia spectrum disorders (SSDs) often experience pervasive feelings of loneliness, which are considered a significant barrier to treatment and recovery.

**Aim** As impaired social cognition may contribute to increased loneliness and less skillful social interactions, this study examines the relationships between loneliness and measures of social cognition and functional outcome from the Social Cognition Psychometric Evaluation (SCOPE) study.

**Methods** This study evaluated the relationship between loneliness, social cognitive ability, and social functioning in the context of a large-scale psychometric investigation. We also explored the associations of select demographic characteristics and clinical variables on the endorsement of loneliness in persons diagnosed with a psychotic disorder.

**Results** Seventy-four stable outpatients with SSDs and 58 healthy controls completed the UCLA Loneliness Scale in addition to the standard SCOPE battery. Our findings support prior research indicating persons diagnosed with a psychotic disorder experience greater levels of loneliness than normative groups. However, the results also indicate that self-reported loneliness is not associated with social cognitive abilities or functional outcome in psychosis. Regression analyses indicate that roughly half the variance in loneliness endorsed by persons with SSDs is accounted for by clinical variables, with loneliness most strongly associated with guilt and self-esteem.

**Conclusion** These findings suggest that treatments aiming to reduce perceived social isolation in psychosis should incorporate techniques to bolster self-esteem, reduce guilt, and improve depressive symptoms.

**Keywords** Loneliness · Psychosis · Schizophrenia · Social cognition · Self-esteem · Guilt

## Introduction

Loneliness, defined as perceived social isolation [1], is more strongly related to subjective aspects of social isolation than objective indicators of solitude [2]. Subjective indicators reflect an individual's perception of the (in)

adequacy of their social relationships [3] while objective indicators assess social involvement in clubs/organizations, social network size and frequency of contact [4]. This is an important distinction as individuals with relatively frequent instances of social contact and a dense social network may experience loneliness (“alone-in-a-crowd”) above

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and beyond individuals with far fewer contacts but a more close-knit social network (“alone-but-not-lonely”) [5, 6]. As such, loneliness has been conceptualized as a deficiency in achievement of the desired quantity and/or quality of one’s social relationships [6], a mismatch that produces significant distress [7].

The majority (80.1%) of adults with SSDs report feeling lonely and socially disconnected in the past year [8]. These individuals are also more than twice as likely to endorse loneliness and social isolation than the general population [9]. In fact, loneliness was ranked as one of the top two barriers to recovery respondents expected to experience over the next 12 months [10]. Importantly, experiences of loneliness can significantly hamper overall health and impede an individual’s recovery from mental illness [11]. Although loneliness appears to be a significant problem for persons with psychotic disorders and may contribute to diminished health outcomes for this group, loneliness is often overlooked as a primary outcome variable in the psychosis literature.

In an effort to understand the role of loneliness in psychosis, it is important to identify variables associated with this construct in this population. Results from large-scale epidemiological studies indicate certain demographic characteristics are significantly associated with the frequency and degree of loneliness endorsed by persons with SSDs [10, 12]. Specifically, these studies suggest women may be more likely to endorse feelings of loneliness than men [9, 12]. They also posit that living, studying and/or working with others may promote opportunities for social engagement, thus reducing objective social isolation and potentially impacting loneliness [12]. Additional research indicates perceived social isolation may be more closely associated with psychosocial factors and clinical variables.

Following from the foregoing, lonelier persons with SSDs report significant issues with self-concept, including lower self-esteem and diminished feelings of self-efficacy [13, 14]. Loneliness is also strongly related to depression after a psychotic episode [15], with several studies suggesting lonelier individuals are more depressed [13, 16–19]. Going beyond expected associations between depression and subjective loneliness, evidence suggests greater loneliness may be associated with more severe positive symptoms, including hallucinations, delusions, and/or paranoia [9, 20, 21]. Despite increased awareness of and emerging research on loneliness, few studies have examined independent and combined contributions of clinical factors such as symptoms and self-concept on loneliness in psychosis.

Furthermore, considering lonelier individuals tend to form more negative expectations and endorse less forgiving attributions of social experiences [1], it is plausible that impaired social cognition impedes frequent and rewarding social opportunities, which may lead to increased loneliness. This may be particularly pronounced in ambiguous

situations that require interpretation of less straightforward social information or in contexts that elicit stress and anxiety [22]. A recent systematic review indicates minimal research has investigated the relationships between loneliness and social cognitive abilities and social functioning in psychosis [23]. This is particularly problematic as many treatments that incorporate strategies to improve social skills or reduce social cognition deficits are shown to ameliorate loneliness in non-clinical groups [7]. A comprehensive investigation of loneliness as it relates to social cognition and functioning may reveal unique needs and specific barriers to social integration for persons with psychotic disorders.

The purpose of the current study is to compare the degree of loneliness reported by persons with SSDs and healthy controls from the community (Aim 1). We expect clinical participants to report significantly more frequent feelings of loneliness than control participants (Hypothesis 1). We will also examine the relationship between perceived social isolation, social cognitive ability, and social functioning evaluated in the context of a large-scale psychometric investigation [24] (Aim 2). We expect increased loneliness to be associated with worse performance on tasks of social cognition and functioning across both groups (Hypothesis 2.1). We anticipate the association between loneliness scores and social cognitive performance to be strongest on measures that require interpretation of complex social information (i.e., measures of theory of mind, social perception, and attributional style) compared to less ambiguous contexts (i.e., emotion recognition tasks) (Hypothesis 2.2). Finally, we evaluate associations between loneliness and demographic characteristics (e.g., gender), psychosocial variables (e.g., self-esteem), and clinical factors (e.g., symptom severity) of persons with SSDs (Aim 3). We anticipate that psychological variables such as self-esteem, depression and paranoia will account for more variance in self-reported loneliness than demographic characteristics and objective social isolation (Hypothesis 3).

## Method

### Participants

The study took place within the larger context of the SCOPE study and was specific to the site at the University of North Carolina at Chapel Hill. Clinical participants were primarily recruited from the North Carolina Psychiatric Research Center (NCPRC) and UNC Center for Excellence in Community Mental Health (CECMH). Patients required a diagnosis of schizophrenia or schizoaffective disorder confirmed by the Mini-International Neuropsychiatric Interview (MINI) [25] and the Psychosis Module from the Structured Clinical Interview for DSM-IV (SCID) [26]. Clinicians and/

or trained research assistants at UNC-CH conducted all diagnostic interviews. Prospective medical record review was also used to confirm diagnosis.

Clinical participants were excluded if they were hospitalized within the last 2 months. Participants were required to be on a stable medication regimen for at least 2 months prior to enrollment, although they were not excluded if

psychiatrically stable while not receiving antipsychotic medication. Control participants were recruited through community flyers and online advertisements, and were selected for similarities in age and gender to clinical participants. Additionally, control participants were excluded from participation for meeting criteria for any Axis I/II disorders according to the DSM-IV, or if they had a

**Table 1** Participant demographic and clinical characteristics

Characteristic	SSD participants ( <i>n</i> = 74)		HC participants ( <i>n</i> = 58)	
	<i>n</i>	(%)	<i>n</i>	(%)
Male	53	71.6	40	69.0
Race				
Caucasian	48	64.9	32	55.2
African American	23	31.1	23	39.7
Asian	1	1.4	1	1.7
Other	2	2.8	2	3.4
Ethnicity*				
Hispanic	1	1.4	5	8.6
Non-Hispanic	73	98.6	53	91.4
Diagnosis				
Schizophrenia	43	58.1		
Schizoaffective	30	40.5		
Psychosis NOS	1	1.4		
Medication type				
Typical	10	13.5		
Atypical	57	77.0		
Combination	5	6.8		
Unmedicated	2	2.7		
Characteristic	SSD participants ( <i>n</i> = 74)		HC participants ( <i>n</i> = 58)	
	Mean	SD	Mean	SD
Age (years)	39.35	11.18	41.67	12.75
Education (years)**	13.87	2.67	15.15	1.66
Maternal education (years)	15.23	2.82	14.29	2.71
Paternal education (years)	15.35	3.82	14.12	3.24
UCLA Loneliness Scale	27.46	14.87	15.76	12.35
WRAT-3	100.30	13.16	102.38	10.18
UPSA-B	73.02	14.14	–	–
SSPA-Avg.	4.24	0.45	4.70	0.24
SLOF <sub>INF</sub> -Avg.	4.27	0.52	4.72	0.33
SLOF <sub>RA</sub> -Avg.	4.24	0.35	5.15	0.12
PANSS				
Positive total	16.53	4.88		
Negative total	16.34	6.00		
General total	35.14	7.10		
Overall total	68.00	13.65		

UCLA UCLA Loneliness Scale, WRAT The Wide Range Achievement Test 3 reading-subscale, UPSA-B UCSD Performance-Based Skills Assessment-Brief, SSPA Social Skills Performance Assessment, SLOF Specific Level of Functioning Scale, <sub>INF</sub> informant report, <sub>RA</sub> assistant report; PANSS Positive and Negative Syndrome Scale

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

first-degree family member with a history of a psychotic disorder. Demographic and clinical characteristics of the sample can be found in Table 1.

All participants were considered ineligible based on: (1) presence/history of intellectual disability; (2) presence/history of brain injury and/or neurological disorder (e.g., seizures, multiple sclerosis); (3) sensory limitation that would interfere with assessment (e.g., blindness/deafness), or (4) evidence of non-nicotine substance dependence in the past 6 months, with substance use not being exclusionary. Evidence of substance dependence was collected from patients' healthcare providers, via chart review, and/or through substance use disorder modules from the SCID [26].

## Measures

### Loneliness

The UCLA Loneliness Scale is widely considered the gold-standard measure of perceived social isolation [27]. Participants completed this 20-item self-report scale, which asked respondents to rate the adequacy of their social relationships (e.g., "I feel as if nobody really understands me") and report on recent feelings of loneliness (e.g., "I feel isolated from others") [28].

### Social cognition

We administered candidate measures of social cognition from the final phase of the Social Cognition Psychometric Evaluation (SCOPE) study [24]. Tasks included the Bell Lysaker Emotion Recognition Task (BLERT) [29], Penn Emotion Recognition Task (ER-40) [30], Reading the Mind in the Eyes Task (Eyes) [31], The Awareness of Social Inferences Test, Part-III (TASIT) [32], Hinting Task [33], Mini Profile of Nonverbal Sensitivity (MiniPONS) [34], Social Attribution Task—Multiple Choice (SAT-MC) [35], The Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT) [36] and Intentionality Bias Task (IBT) [37].

The majority of tasks included in the SCOPE battery have demonstrated acceptable test–retest reliability and internal consistency when administered to a large sample of individuals diagnosed with SSDs [24]. Notable exceptions include a measure of attributional style (IBT) which demonstrated inadequate test–retest reliability and internal consistency values as well as alternate versions of a task of social perception (SAT-MC) which demonstrated questionable test-reliability that may reflect non-equivalence of forms [24]. For additional information about the SCOPE study, please see Pinkham et al. [24].

### Social competence, functional capacity, and informant-rated everyday functioning

Social skills were assessed with The Social Skills Performance Assessment (SSPA) [38]. Participants and an experimenter acted out two social situations: meeting a new neighbor and persuading a landlord to fix a bathroom leak. Scenes were audio-recorded and rated by a blind-to-diagnosis, expert coder involved in all previous ratings for SCOPE. The SSPA has shown acceptable internal consistency and good test–retest reliability in schizophrenia research [39].

The ability to perform relevant community and daily living skills was assessed using the UCSD Performance-Based Skills Assessment-Brief (UPSA-B) [40], a performance-based measure of functional capacity (note: control participants did not complete the UPSA). We also obtained informant ratings on the Specific Level of Functioning Scale (SLOF) [41]. A research assistant and/or an informant identified by the participant completed observer-reports of the SLOF. The UPSA and SLOF have consistently demonstrated sound psychometric properties when administered to persons with SSDs [42].

### Employment status

A demographic questionnaire was administered to all participants and included questions about current employment or educational involvement. Options included full-time work/study, part-time work/study, and economic/academic inactivity (i.e., unemployment).

### Cognitive ability

The Wide Range Achievement Test (WRAT-3) reading-subscale was used to provide an estimate of IQ [43].

### Symptomatology

Symptom severity was measured using the Positive and Negative Syndrome Scale (PANSS) [44], a semi-structured interview examining clinical participants' recent experiences with positive, negative and general psychopathology symptoms. The Persecution and Deservedness Scale (PaDS) [45] is a self-report questionnaire used to examine participants' degree of paranoid thinking and perceptions of his/her deservingness of persecution. Depressive symptoms were also assessed using the Beck Depression Inventory, second edition (BDI-II) [46]. The PANSS and BDI-II are considered the gold-standard assessments of psychosis-related and depressive symptoms, both having demonstrated adequate internal consistency and good test–retest reliability in clinical research [47, 48]. The PaDS subscale scores have been

shown to be valid and reliable indicators in clinical and non-clinical samples [45].

### Self-concept

We used the Rosenberg Self-Esteem Scale (RSES) [49] to gauge participants' perceptions of their own self-worth. The RSES consists of 10 items that examine both positive and negative feelings about the self. The RSES has not been validated for use with schizophrenia, although reliability and validity have been assessed in normative samples [50].

### Objective social isolation

Two items from the Positive and Negative Syndrome Scale (PANSS) [44] were used to approximate objective social isolation in the present study. Specifically, persons who were rated higher (i.e., 5–7) on items N4 (passive social withdrawal) and G16 (active social avoidance) demonstrated diminished social contact and were considered elevated on this measure of objective social isolation.

### Procedure

With the project approved by the UNC-CH Institutional Review Board, participants provided signed informed consent and completed social cognitive and functional outcome measures. Task block order and the order of individual tasks within the social cognitive battery were counterbalanced across participants. A rater trained using the same procedures employed in SCOPE conducted diagnostic and symptomatic interviews. Participants were asked to complete self-report questionnaires, including the UCLA Loneliness Scale and Rosenberg Self-Esteem Scale, at the end of the assessment. All participants were asked to return for a retest assessment scheduled approximately 2-weeks after visit 1.

### Statistical analyses

Data analyses were performed using the Statistical Package for the Social Sciences (SPSS, version 26). Statistical significance was defined as  $p < 0.01$  to provide some correction for multiple testing. With the exception of presenting test–retest reliability estimates for the UCLA Loneliness Scale, all analyses were completed using data from tasks completed at visit 1.

To evaluate Aim 1, we used independent samples  $t$  tests to compare levels of loneliness endorsed by clinical and control participants. Next, we computed Pearson's  $r$  correlation coefficients to examine relationships between loneliness and social cognition and functioning to test Aim 2. To evaluate the role of demographic characteristics and clinical variables on loneliness (Aim 3), we conducted additional

correlation analyses between loneliness and age, gender, and employment status as well as Self-Reported Depression (BDI), Self-Esteem (RSES), Paranoia/Persecution (PaDS), and other Psychosis-Related Symptoms (PANSS). Cohen's conventions for small, medium and large effects were used.

To further evaluate Aim 3 and examine the independent and combined contributions of demographic information and clinical variables on loneliness in the clinical group, we created a regression model in blocks. The first block consisted of relevant demographic characteristics, including age, gender, employment status and objective social isolation. To examine the increase in predictive power of clinical variables, a second block was created that included scores from the Rosenberg Self-Esteem Scale, Persecution and Deservedness Scale, and Beck Depression Inventory. Except for paranoia and depression, which are more comprehensively assessed by the PaDS and BDI in the second block, PANSS subscale scores that were significantly associated with loneliness comprised a third and final block to explore the contribution of psychosis-related symptoms in predicting loneliness. We used  $R^2$  and adjusted  $R^2$  statistics to determine the extent to which each block accounted for additional variance in loneliness.

## Results

### Participants

Seventy-four clinical and 58 control participants completed the assessment. Groups did not differ in regard to age, gender, race, estimated IQ, or parental education level (see Table 1). Control participants were significantly more likely to identify as Hispanic or Latino, whereas clinical participants completed significantly fewer years of education than controls.

### Loneliness among persons with and without a psychotic disorder

#### Test–retest reliability and internal consistency

The UCLA Loneliness Scale demonstrated adequate test–retest reliability and excellent internal consistency when administered to clinical ( $r = 0.77$ ,  $\alpha = 0.94$ ) and control participants ( $r = 0.85$ ,  $\alpha = 0.95$ ).

#### Between-group differences

Results from an independent samples  $t$  test revealed significantly greater loneliness endorsed by SSD participants as compared to controls ( $M_{SSD} = 27.46$ ,  $M_{HC} = 15.76$ ,  $t(130) = -4.83$ ,  $p < 0.001$ ,  $d = 0.86$ ) (Table 1). These scores

**Table 2** Correlations between measures of loneliness, social cognition, and functional outcome measures in SSD participants

	SSD participants	Healthy controls
Social cognitive <sup>a</sup>	UCLA loneliness	
BLERT	0.058	−0.325 <sup>†</sup>
ER-40	−0.095	−0.203
Eyes	0.099	−0.150
Hinting	0.054	0.099
TASIT	0.102	−0.172
SAT-MC	0.013	−0.191
MiniPONS	0.160	−0.256
MSCEIT	−0.042	−0.103
IBT	−0.134	0.030
Functional outcome <sup>b</sup>		
UPSA total	0.044	−
SSPA average	0.005	−0.094
SLOF <sub>INF</sub> <sup>c</sup>	−0.135	−0.234
SLOF <sub>RA</sub>	−0.252 <sup>†</sup>	−

<sup>†</sup> $p < 0.05$

<sup>a</sup>Social Cognition measures: Bell Lysaker Emotion Recognition Task (BLERT), Penn Emotion Recognition Task (ER-40), Reading the Mind in the Eyes Task (Eyes), Hinting Task, The Awareness of Social Inferences Test, Part-III (TASIT), Social Attribution Task—Multiple Choice (SAT-MC), Mini Profile of Nonverbal Sensitivity (MiniPONS), Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT) and Intentionality Bias Task (IBT)

<sup>b</sup>Functional outcome measures: UCSD Performance-Based Skills Assessment-Brief (UPSA-B); Social Skills Performance Assessment (SSPA); Specific Level of Functioning Scale (SLOF), informant (<sub>INF</sub>) and research assistant (<sub>RA</sub>) report

<sup>c</sup>Although all participants were asked to identify an informant, only 79.7% ( $n = 59$ ) of SSD participants' informants and 67.2% ( $n = 39$ ) of HC informants completed the measure

indicate clinical participants experienced frequent loneliness, whereas control participants endorsed average rates of loneliness [51].

### Social cognition and functioning

We calculated Pearson's  $r$  correlation coefficients to examine the relationships between loneliness and tasks of social cognition and functioning. No significant associations were found between loneliness and measures of social cognition when administered to SSD participants (Table 2). Greater loneliness in the clinical group was associated with lower social functioning on the informant-completed SLOF, although this trend-level association was eliminated when controlling for depression.

For healthy controls, associations between loneliness and measures of social cognition did not meet the corrected significance value of  $p < 0.01$  (Table 2). Loneliness was not

**Table 3** Correlations between loneliness and demographic variables, clinical factors

	SSD participants ( $n = 74$ )	HC participants ( $n = 58$ )
Demographics	UCLA loneliness	
Age	0.075	0.163
Gender	−0.289 <sup>†</sup>	−0.028
Employment status	−0.180	−0.239
Symptoms	UCLA loneliness	
PANSS <sub>Pos</sub>	0.214	
Suspiciousness/persec.	0.297*	
PANSS <sub>Neg</sub>	0.198	
Emotional withdrawal	0.435**	
Passive social withdrawal	0.294 <sup>†</sup>	
PANSS <sub>Gen</sub>	0.517*	
Somatic concern	0.277 <sup>†</sup>	
Anxiety	0.389**	
Guilt	0.441**	
Tension	0.276 <sup>†</sup>	
Depression	0.638**	
Motor retardation	0.242 <sup>†</sup>	
Active social avoidance	0.291*	
Self-report		
BDI	0.642*	0.642*
PaDS <sub>Pers</sub>	0.507*	0.588*
PaDS <sub>Des</sub>	0.061	0.168
RSES	−0.651*	−0.586*

Positive and Negative Syndrome Scale (PANSS)—Positive (<sub>Pos</sub>), Negative (<sub>Neg</sub>), and General Psychopathology (<sub>Gen</sub>), *BDI* Beck Depression Inventory, second edition; Persecution and Deservedness Scale (PaDS)—Paranoid Thinking (<sub>Pers</sub>) and Deservedness of Persecution (<sub>Des</sub>) subscales; *RSES* Rosenberg Self-Esteem Scale

<sup>†</sup> $p < 0.05$ , \* $p < 0.01$ , \*\* $p < 0.001$

<sup>a</sup>All other items on the PANSS were not significantly related to loneliness

significantly related to any measures of functional outcome in the control group.

### Relationships between loneliness, demographic variables, and clinical factors

We calculated Pearson's  $r$  correlation coefficients to examine relationships between loneliness and demographic variables of interest as well as several clinical factors. Loneliness was significantly associated with gender in the clinical group, with women endorsing greater loneliness than men ( $M_{\text{Women}} = 34.24$ ,  $SD = 16.20$ ;  $M_{\text{Men}} = 24.77$ ,  $SD = 13.54$ ;  $t(72) = 9.47$ ,  $p = 0.01$ ). Loneliness endorsed by persons with SSDs was not associated with age or employment status. In contrast, our findings suggest a negative relationship



between loneliness and self-esteem in psychosis. Loneliness was also positively correlated with self-reported depressive symptoms and paranoia, as well as social isolation and other clinically rated symptoms on the PANSS (Table 3).

Loneliness in controls was not significantly associated with any demographic characteristics. Correlational analyses revealed significant, moderate relationships between feelings of loneliness and depression, paranoia and self-esteem endorsed by control participants.

Simple linear regression analyses indicated that demographic characteristics, including objective social isolation, accounted for 10.6% of variance in loneliness reported by clinical participants (adjusted  $R^2=0.106$ ,  $F(5, 67)=2.71$ ,  $p=0.028$ ). Sequential regression analyses revealed depression, paranoia and self-esteem accounted for an additional 39.8% of variance in loneliness scores (adjusted  $R^2=0.504$ ,  $F(3, 64)=10.15$ ,  $p<0.001$ ). Notably, the influence of gender on loneliness was reduced and became non-significant when the second block was included in the model. Adding remaining symptoms of psychopathology as a third and final block explained an additional 8.2% of variance in loneliness (adjusted  $R^2=0.586$ ,  $F(3, 61)=10.247$ ,  $p<0.001$ ). Our findings suggest self-esteem and guilt are the strongest predictors of loneliness in persons with SSDs (see Table 4).

## Discussion

The results of this study support previous research demonstrating that persons diagnosed with a psychotic disorder report significantly more loneliness than persons without the disorder [9]. To our knowledge, this is also the first study to examine relationships between loneliness and systematically validated measures of social cognition and functional outcome in psychosis. Our findings suggest self-reported feelings of loneliness are largely unrelated to social cognition and independently evaluated social functioning in psychosis, but are closely linked to depression. Interestingly, clinical ratings of PANSS items measuring social withdrawal are significantly related to subjectively reported loneliness. Finally, analyses examining independent and combined contributions of demographic and clinical characteristics on self-reported loneliness revealed self-esteem and guilt showed the strongest relationships with loneliness in the clinical group.

One possible explanation for the lack of observed relationships between loneliness, social cognition, and social functioning is that the domains of social cognition included in SCOPE may be less appropriate predictors of loneliness than specific aspects of social cognition (e.g., maladaptive perceptions of social situations) and social functioning (e.g., inappropriate self-disclosure) examined in normative groups [7]. Alternatively, loneliness may be related to social cognition and social skill in a particular subset of persons with an

SSD diagnosis. For instance, persons with a psychotic disorder who demonstrate adequate social cognition and functioning may feel lonelier when experiencing a mismatch between their desired and current relationship quantity, quality or type. For example, a person experiencing limited psychiatric impairment may endorse increased loneliness during periods of low social contact, elevated interpersonal conflict, diminished social support, or lack of important types of relationships (e.g., confidant, romantic partner). As such, it is possible that the non-significant associations between loneliness and social cognition and functioning could have resulted from examining these constructs across all clinical participants, rather than in particular subgroups. It is also plausible that loneliness in psychosis may be related to other processes or impairments related to the disorder, including emotion dysregulation and attentional biases that enhance the salience of negative information and events [7, 19]. Finally, it is also possible that social cognition and loneliness are unrelated constructs in this population. As effect sizes demonstrating the relationships between loneliness and social cognitive abilities were small, these findings suggest that the lack of significance is likely not due to insufficient statistical power.

Furthermore, our findings suggest amotivation, suspiciousness, and affective symptoms may be associated with the degree of loneliness endorsed by persons with SSDs. Similar to results from two large epidemiological studies [9, 12], our findings indicated women with a psychotic disorder were more likely than men to report increased feelings of loneliness. A meta-analysis suggests women with psychosis endorse more affective symptoms and persecutory delusions than men [52], which may contribute to increased loneliness. It is also important to note that women in the present study were significantly more likely to have a diagnosis of schizoaffective disorder ( $n=15$ , 71.4%) compared to men ( $n=15$ , 28.3%). Although it is possible that the observed differences in loneliness reported by male and female participants in the clinical group may be attributable to differences in endorsement of affective symptoms, additional research is needed to explore ways in which men and women may differ in regard to the degree and frequency of loneliness, as well as the ways in which they cope with and manage lonely feelings.

Although it is widely accepted that loneliness and depression are related but separable constructs in non-psychotic samples [53], careful attention should be given to the interplay of loneliness and affective symptoms in psychosis. Our findings suggest nearly half the variance in loneliness endorsed by persons with SSDs is accounted for by variation in clinical variables, with loneliness most strongly associated with self-esteem, guilt, paranoia and depression. While guilt and worthlessness are common features of depression [54], the strength of the association between guilty feelings and self-reported loneliness observed in this study is noteworthy.

**Table 4** Regression models summarizing independent and combined contributions of demographic characteristics and clinical factors to loneliness

	$R^2$	Adjusted $R^2$	$F$	$p$	$b^*$	$t$	$p$	$sr^2$
<b>Model 1</b>								
Demographics	0.168	0.106	2.705	0.028				
Age					0.019	0.162	0.872	0.000
Gender					<b>-0.289</b>	-2.559	<b>0.010</b>	0.081
Employment					-0.186	-1.609	0.112	0.032
Social isolation								
Active social avoidance <sub>G16</sub>			0.080	0.635	0.527	0.005		
Passive social withdrawal <sub>N4</sub>			0.172	1.378	0.173	0.024		
<b>Model 2</b>								
Demographics	0.559	0.504	10.145	<0.001				
Age					-0.072	-0.818	0.416	0.005
Gender					-0.011	-0.122	0.903	0.000
Employment					-0.101	-1.147	0.256	0.009
Social isolation								
Active social avoidance <sub>G16</sub>			0.073	0.777	0.440	0.004		
Passive social withdrawal <sub>N4</sub>			0.041	0.419	0.677	0.001		
Mood								
Depression					0.169	1.197	0.236	0.010
Self-concept								
Self-esteem					<b>-0.457</b>	-3.830	<b>&lt;0.001</b>	0.101
Paranoia								
PaDS <sub>Pers</sub>					-0.233	2.163	0.034	0.032
<b>Model 3</b>								
Demographics	0.649	0.586	10.247	<0.001				
Age					-0.071	-0.804	0.425	0.004
Gender					-0.071	-0.816	0.418	0.004
Employment					-0.112	-1.368	0.176	0.011
Social isolation								
Passive social withdrawal <sub>N4</sub>			0.139	1.369	0.176	0.011		
Active social avoidance <sub>G16</sub>			-0.055	-0.582	0.563	0.002		
Mood								
Depression					0.138	1.057	0.295	0.006
Self-concept								
Self-esteem					<b>-0.375</b>	-3.173	<b>0.002</b>	0.058
Paranoia								
PaDS <sub>Pers</sub>					0.129	1.237	0.221	0.009
Symptoms (item)								
Anxiety <sub>G2</sub>					0.040	0.413	0.681	0.001
Guilt <sub>G3</sub>					<b>0.308</b>	3.449	<b>0.001</b>	0.069
Emotional withdrawal <sub>N2</sub>					0.132	1.369	0.176	0.011

Only items from the Positive and Negative Syndrome Scale (PANSS) that were significantly associated with loneliness and not redundant with other measures were included in the “Symptoms” block in Model 3 above (e.g., although the PANSS depression item was significantly associated with loneliness, this item was excluded from the third block as depressive symptoms were accounted for by the Beck Depression Inventory)

Persecution and Dervedness Scale (PaDS)—paranoid thinking (<sub>Pers</sub>) subscale

Bold values indicate statistics that have reached the more conservative significance value to correct for multiple comparisons. All associations entail a statistical significance value of less than or equal to .01 (i.e.,  $p \leq .01$ )

On one hand, it is possible that negative thinking patterns or distorted cognitions related to the self, others and the world

may independently cause or exacerbate feelings of guilt and loneliness [21]. On the other hand, guilt—like shame and



embarrassment—is a “self-conscious emotion” that may reflect our self-image and influence our inferences about the way others perceive us [55], thereby impacting loneliness and perceived social isolation.

Consequently, treatments targeting perceived social isolation in psychosis should incorporate techniques to improve self-esteem, reduce guilt, decrease paranoia, and ameliorate depressive symptoms. For instance, loneliness interventions should incorporate cognitive behavioral therapy techniques such as cognitive restructuring and social skills training to improve the quality of, comfort with, and satisfaction gleaned from in-person social situations [56]. Psychosocial interventions provided in a group setting may be particularly beneficial for lonely persons with SSDs as this format may facilitate positive in-person social interactions as well as combat social anhedonia and defeatist beliefs often endorsed by this population [57]. Although the study of loneliness in psychosis is relatively nascent, these experiences are widespread and an important source of distress requiring improved understanding as well as the development, refinement, and evaluation of treatments targeting loneliness.

Finally, this study has a number of limitations. First, we cannot draw firm conclusions about the direction or reliability of the relationships between loneliness and its correlates over time. Although the UCLA Loneliness Scale is the most widely used measure of loneliness [58] and demonstrated sound psychometric properties in this study, we administered the initial version of this measure which has been critiqued for its potential to elicit systematic response biases stemming from negatively worded items [59]. Relatedly, self-report questionnaires can also be impacted by recall bias and/or respondents’ current emotional states [21]. As we used self-report questionnaires to assess loneliness, self-esteem, guilt, paranoid thoughts, and depressive symptoms, it should also be noted that shared method variance might have contributed to the observed relationships between these constructs in both groups.

In addition, data for this project were collected within the context of a large-scale psychometric evaluation of social cognition measures widely used in schizophrenia research [24]. The UCLA Loneliness Scale and Rosenberg Self-Esteem Scale were administered only to participants at the University of North Carolina who opted to complete additional questionnaires at the end of the assessment visit. As such, the sample size is smaller than what would be expected given the number of statistical tests included in the analyses. Although a more conservative statistical significance value of  $p < 0.01$  was used to provide some correction for multiple testing, it is important to note the study may be underpowered to test several hypotheses. Finally, this sample was quite heterogeneous and involved participants recruited from coordinated specialty care clinics as well as more traditional community mental health centers. Although participants

involved in the project reflect the racial/ethnic background of this region, it is also unclear whether this sample is broadly representative of the larger population of persons with psychotic disorders globally or across the United States. Thus, interpretations of the present findings should be regarded with caution.

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## Compliance with ethical standards

**Conflict of interest** Dr. Harvey has received consulting fees or travel reimbursements from Alkermes, Akili, Boehringer Ingelheim, Intra Cellular Therapies, Otsuka America, Sanofi Pharma, Sunovion Pharma, Takeda Pharma, and Teva Pharma during the past year. He has a research grant from Takeda and from the Stanley Medical Research Foundation. In the past 3 years, Dr. Jarskog has received research grant funding from NIH, Auspex/Teva, Boehringer-Ingelheim and Otsuka. The remaining authors declare that they have no conflict of interest pertinent to this study.

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