Social Inclusion and its Interrelationships with Social Cognition and Social Functioning in First-Episode Psychosis

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Abstract

Aim: People with psychosis are at risk of social exclusion. Research is needed in this area due to the lack of direct measurement of social inclusion, which becomes salient in adolescence and is relevant to first-episode psychosis (the onset of which typically occurs during or shortly after adolescence). Social inclusion may be impacted by impaired social cognition and social functioning, which are related features observed in psychosis. The aim of this study was to explore interrelationship(s) between social cognition, social functioning, and social inclusion in first-episode psychosis while controlling for symptomatology (positive, negative, and depressive symptoms) and demographic characteristics.

Methods: A series of cross-sectional hierarchical multiple regressions were conducted to examine whether: social cognition (Theory of Mind, emotion recognition) predicted social functioning; social functioning predicted social inclusion, and; whether social functioning mediated the relationship between social cognition and social inclusion in people aged 15-25 (M=20.49, SD=2.41) with first-episode psychosis (N=146). Age, sex, premorbid IQ, positive and negative psychotic symptoms, and depression were control variables.

Results: Poor facial emotion recognition (^{2}=-.22, p<.05) and negative symptoms (^{2}=-.45, p<.001) predicted lower social functioning. Role-specific social functioning (i.e., current employment) predicted greater social inclusion (^{2}=.17, p<.05). Higher depression symptomatology predicted lower social inclusion (^{2}=-.43, p<.001). Social functioning did not mediate the relationship between social cognition and inclusion. Psychotic symptoms were unrelated to social inclusion.

Conclusions: Employment and depression may influence social inclusion somewhat independently of psychotic symptomatology in first-episode psychosis. Inferences should be viewed with caution given this study did not involve longitudinal data.

Keywords: *First-episode psychosis*; *schizophrenia; social inclusion; social cognition; social functioning*

Social inclusion is an emerging construct that researchers are seeking to better understand given evidence for its relationship to health/wellbeing (Floyd et al., 2016). Social inclusion has been defined as the experience of acceptance/belonging through opportunities to participate in valued social activities (Social Inclusion Unit, 2008). Social exclusion has been conceived as the opposite of social inclusion (Ryan & Sartbayeva, 2011), and may be defined as the experience of loneliness/isolation in relation to an absence of the above-mentioned opportunities for social participation.

People with schizophrenia are widely considered to be socially excluded (Social Exclusion Unit, 2004), yet direct measurement of social inclusion is infrequent in this population (Baumgartner & Burns, 2014;Huxley et al., 2016). While schizophrenia represents the end point on a continuum of psychotic severity (van Os, Kenis & Rutten, 2010), psychosis onset typically occurs during adolescence. Two-thirds of affected people experience first-episode psychosis (FEP) before 25 years-of-age (Baldwin et al., 2005;Morgan et al., 2012). Social inclusion becomes salient for young people during this phase (Blakemore & Mills, 2014), and is a common goal for young people with psychosis (Van Schalkwyk, Davidson & Srihari, 2015); FEP onset can disrupt the transition to adult roles and initiate social disengagement (Lau, Black & Sturdy, 2010). The subsequent social exclusion experienced by people with FEP is not alleviated by symptomatic remission (Alvarez-Jimenez et al., 2012;Revier et al., 2015).

Compromised social functioning and social cognitive deficits are core features of psychosis (Penn et al., 1997) with implications for social inclusion. Social functioning can be defined as age-appropriate engagement in social roles (Jaracz, Górna & Rybakowski, 2007) regardless of whether they are valued or not. Impaired social functioning is often present

prior to psychosis onset (Addington et al., 2008), during FEP, and beyond remission (Addington et al., 2010). Evidence exists for a relationship between symptomatology and social dysfunction in psychosis (Ventura et al., 2009).

Social cognition can be defined as information processing about the self and others in social contexts (Penn, Sanna & Roberts, 2008). Subdomains include theory of mind (ToM) and emotion recognition (Green et al., 2005). ToM involves the ability to infer one's own and other people's mental states (Bora et al., 2006). Emotion recognition involves the capacity to make emotional inferences based on the facial/vocal expressions of others (Irani et al., 2012). There are large deficits in ToM (Cohen's d=−1.255, 95%CI [−1.441, −1.069] p<.001 [Sprong et al., 2007]) and emotion recognition (d=−0.91, 95%CI [−0.97, −0.84], p value not reported [Kohler et al., 2010]) in psychosis compared to healthy controls.

In chronic psychosis, there is meta-analytic evidence of a large mean correlation ($\hat{\mu}_A$=.48) between ToM and social functioning (Fett et al., 2011), and of a relationship between emotion recognition deficits and impaired social functioning (N=24, ′=0.36, 95%CI [0.14, 0.57], p<.001 [Irani et al., 2012]). Fewer studies have examined these phenomena in FEP, where the absence of potentially confounding long-term illness effects may allow a clearer understanding of such relationships (Sullivan et al., 2013). Preliminary evidence suggests a similar association in FEP to that found in chronic populations (Horan et al., 2012). There is no research examining the impact of the relationship between social cognition and social functioning on social inclusion in psychosis. Hence it is important to examine whether this established relationship relates to social inclusion in FEP.

The social inclusion literature is mostly qualitative/conceptual (Gingrich & Lightman, 2015). There is little research on social inclusion in psychosis, especially regarding the role of specific illness characteristics (Killaspy et al., 2014). Social dysfunction is one such characteristic that is likely associated with social exclusion in FEP (Fisher et al., 2008). Employment may be the most important aspect of social function in psychosis (Evans & Repper, 2000), where unemployment is the primary contributor to psychosocial disability (Killackey et al., 2006). The estimated unemployment rate in FEP is 40%–50%, yet most people with FEP want to work (Killackey et al., 2013a). Impaired global social function, and unemployment in particular, are likely to negatively impact social inclusion in FEP (Lau et al., 2010).

Social cognition impacts the perception of inclusion (Rosenfeld, Lieberman & Jarskog, 2011) yet also facilitates the interpersonal interactions intrinsic to social functioning (Lysaker et al, 2013;Penn et al., 1997), which in turn likely impacts social inclusion in FEP as noted above. There is emerging evidence that young people with psychosis consider social functioning to be integral to perceived social inclusion (Van Schalkwyk et al., 2015). Hence social cognition may not influence the perception of social inclusion in this population after accounting for its effect on social functioning. This suggests that social functioning may mediate the relationship between social cognition and social inclusion in FEP.

This cross-sectional study aimed to determine the relationships between social cognition (ToM and emotion recognition), social functioning, and social inclusion in people aged 15-25 with FEP. A secondary aim was to explore the impact of control variables (demographics and symptomatology) on these relationships. It is hypothesized that: (i) social cognition will positively predict social functioning; (ii) social functioning will positively

predict social inclusion; and (iii) social functioning will mediate the relationship between social cognition and social inclusion.

Method

Setting and Sample

This study involved baseline data analysis from a randomised controlled trial of supported employment (Killackey et al., 2013a) at the Early Psychosis Prevention and Intervention Centre (EPPIC), Orygen Youth Health (a public mental health service for people aged 15-25 in the northwest of Melbourne, Australia). EPPIC clients are offered d24 months of clinical care. Clients with e6 months remaining were eligible to participate. Participants met criteria for a Diagnostic and Statistical Manual of Mental Disorders 4th edition – text revised (DSMIV-TR [American Psychiatric Association, 2000]) psychotic disorder. Exclusion criteria were intellectual disability, florid psychosis, and lack of fluency in English.

Measures

Social Inclusion and Social Functioning.

The Social Inclusion Scale (SIS [Secker et al., 2009]) measures self-reported social inclusion (e.g., *I have felt accepted by my neighbours, I have felt that I am playing a useful part in society, I have felt that what I do is valued by others*) on Likert-type scales from 1 (*Not at all*) to 4 (*Yes definitely*). Items were summed for a score range of 16-64; higher scores indicate greater social inclusion. The SIS has demonstrated reliability and validity (Coombs, Nicholas & Pirkis, 2013). The interviewer-rated Social and Occupational Functioning Assessment Scale (SOFAS) provides a global rating from 0-100 (Goldman, Skodol & Lave, 1992). Higher scores indicate better functioning. The SOFAS has demonstrated reliability and validity (Hilsenroth et al., 2000;Wardenaar et al., 2013). Employment status (*Currently in paid work? No/Yes*) measured role-specific functioning.

Demographic and Clinical Variables.

Demographic information included age, gender, and estimated premorbid IQ via the Wide Range Achievement Test – Fourth Edition Reading Subtest (WRAT-4 [Wilkinson & Robertson, 2006]). Psychotic and other Axis I disorders were determined via the Structured Clinical Interview for DSM-IV-TR (SCID–IV–TR [First et al., 2001]). The Brief Psychiatric Rating Scale – Positive Symptoms subscale (BPRS-PS [Overall & Gorham, 1962]) and the Scale for Assessment of Negative Symptoms (SANS [Andreasen, 1984]) measured positive and negative symptoms. The Center for Epidemiological Studies of Depression (CES-D [Radloff, 1977]) measured self-reported depressive symptomatology.

Social Cognition.

The False Belief and Deception Stories task has demonstrated discriminant validity as a ToM measure (Harrington, Siegert & McClure, 2005). Participants are read stories then asked what a character was thinking and why (first-order), and what a character thought another character was thinking and why (second-order). Correct responses were given one (first-order) or two (second-order) points. Scores were summed to create total scores from 0-26. The Picture Sequencing Task (PST [Langdon & Coltheart, 1999]) has demonstrated reliability and validity as a ToM measure (Bell, 2012). Participants assemble false belief comic strip cards depicting characters performing various actions. Scores were based on correct card positioning; mean scores were calculated and ranged from 0-6. The Hinting Task (Corcoran, Mercer & Frith, 1995) is a ToM measure demonstrating strong psychometric properties (Pinkham et al., 2015). Participants are asked what a character from a story *really* meant by what s/he said. Correct responses were given a score of two; incorrect respondents were given a hint. Subsequent correct responses were given a score of one, incorrect responses a score of zero. Scores were summed to create total scores ranging from 0-20. Higher scores on all tasks indicate superior ToM.

The Diagnostic Analysis of Nonverbal Accuracy (DANVA) – Adult Version measures emotion recognition. It has demonstrated reliability and validity (Nowicki & Carton, 1993). The DANVA–2, Adult Facial Expressions (DANVA–2–AF) comprises 24 photographs: participants have to identify happy, sad, angry, and fearful faces. The DANVA–2, Adult Paralanguage (DANVA–2–AP [Nowicki & Duke, 1994]) comprises 24 audio recordings: participants have to identify the same emotions. On both tasks errors are summed and total scores range from 0-24. Higher scores indicate poorer emotion recognition.

Procedure

The Melbourne Health Human Research Ethics Committee approved the study (2007.648). Informed consent was obtained from participants and parents (where appropriate). From April 2009 until April 2011, 146 participants completed baseline assessments.

Data Analyses

Analyses were conducted using IBM® SPSS® Version 22. Data were screened as per Tabachnick and Fidell (2012).

A three-block enter hierarchical multiple regression tested whether social cognition predicted social functioning while controlling for demographics and symptomatology. Demographics were entered as predictors in block one, symptomatology measures in block two, and social cognition measures in block three. The outcome variable was SOFAS score. A three-block enter hierarchical multiple regression tested whether social functioning predicted social inclusion while controlling for demographics and symptomatology. SIS score was the outcome variable. Demographics were entered as predictors in block one, symptomatology in block two, and SOFAS score in block three. A five-block enter hierarchical multiple regression using the PROCESS script (Hayes, 2013 [see Appendix])

tested whether social functioning mediated the relationship between social cognition and social inclusion while controlling for other variables. SIS score was the outcome variable with demographics entered as predictors in block one, symptomatology in block two, social cognition measures that predicted SOFAS score in block three, SOFAS score in block four, and employment status in block five.

Results

Sample Characteristics

Table 1 shows sample characteristics (*N*=146). Most participants were male, unemployed, not studying, and were prescribed antipsychotic medication in the past 6 months. The most common diagnosis was schizophrenia. The mean SOFAS score (51.47, *SD*=10.39) indicated seriously impaired social functioning. The mean SIS score (42.14, *SD*=6.98) suggested low levels of social inclusion, as did objective indicators (82% not studying, 16% undertaking paid employment). Social cognition mean scores were consistent with previous studies suggesting impaired abilities in FEP compared to controls (Thompson et al., 2012).

(Insert Table 1)

Does Social Cognition Predict Social Functioning?

Demographics were entered in block one of the hierarchical multiple regression, explaining 3% of variance in SOFAS score. Symptomatology was entered in block two, explaining a statistically significant additional 33% of variance, $R^2_{\triangle}$=.33, $F_{\triangle}(3,139)$=23.73, p<.001. Social cognition was entered in block three, explaining an additional 4% of variance. The final model explained 40% of variance in SOFAS score, R^2=.40 (Adjusted R^2=.35), and was statistically significant, $F(11,134)$=8.20, p<.001 (see Table 2). DANVA-2-AF error score

was a significant negative individual predictor of SOFAS score (^{2}=-.22, p< .01). SANS score remained a significant negative predictor of SOFAS score after the inclusion of social cognitive variables, and was the strongest individual predictor in the model (^{2}=-.45, p< .001).

(Insert Table 2)

Does Social Functioning Predict Social Inclusion?

Demographics were entered in block one of the hierarchical multiple regression, and explained <1% of variance in SIS score. Symptomatology was entered in block two, explaining a statistically significant additional 27% of variance, $R^2_{\triangle}$=.27, $F_{\triangle}$(3,139)=17.62, p<.001. SOFAS score was entered in block three, explaining a statistically significant additional 3% of variance, $R^2_{\triangle}$=.03, $F_{\triangle}$(1,138)=5.48, p=.03. The final model explained 30% of variance in SIS score, R^2=.30 (Adjusted R^2=.27), and was statistically significant F(7,138)=8.63, p<.001 (see Table 3). SOFAS score was a significant positive individual predictor (^{2}=.21, p=.02). CES-D score remained a significant negative predictor after the addition of SOFAS score, and was the strongest individual predictor in the model (^{2}=-.41, p<.001). WRAT-4 score was a significant negative individual predictor (^{2}=-.16, p=.04).

(Insert Table 3)

Does Social Functioning Mediate the Relationship between Social Cognition and Social Inclusion?

Demographics were entered in block one of the hierarchical multiple regression and explained <1% of variance in SIS score. Symptomatology was entered in block two, explaining a statistically significant additional 28% of variance, $R^2_{\triangle}$=.28, $F_{\triangle}$(3,139)=17.62,

p<.001. DANVA-2-AF error score was entered in block three, explaining <1% of additional variance. SOFAS score was entered in block four, explaining a statistically significant additional 3% of variance, $R^2_{\triangle}$=.03, $F_{\triangle}$(1,137)=6.02, p=.02. Employment status was entered in block five, explaining a statistically significant additional 2% of variance, $R^2_{\triangle}$=.02, $F_{\triangle}$(1,136)=4.09, p<.05. The final model explained 33% of variance in SIS score, R^2=.33 (Adjusted R^2=.28), and was statistically significant F(9,136)=7.39, p<.001 (see Table 4). The mediation hypothesis was not supported: neither the direct nor indirect effect of DANVA-2-AF error score on SIS score was significant (see Figure 1). With the introduction of current employment, a significant positive individual predictor (^{2}=.17, p<.05), SOFAS score no longer predicted SIS score. CES-D score remained a significant negative predictor and the strongest individual predictor in the model (^{2}=-.43, p<.001).

(Insert Table 4)

(Insert Figure 1)

Discussion

This study is the first to explore relationships between social cognition, social functioning, and social inclusion in FEP. The previously found relationship between emotion recognition and social function in psychosis was replicated (Irani et al., 2012). Role-specific social functioning (i.e., current employment) predicted greater social inclusion, but social functioning did not mediate the relationship between social cognition and social inclusion. Higher depression symptomatology but not psychotic symptomatology predicted lower social inclusion.

Social Functioning and Other Predictors of Social Inclusion

As hypothesised, better social functioning (i.e., current employment) predicted greater social inclusion, complementing evidence that participation is a key component of subjective inclusion in FEP (Cotton et al., 2011; Ramsay et al., 2011). When employment status was

added to the regression model, global social functioning ceased to predict social inclusion. This suggests that in FEP employment is the most important aspect of social function (Evans & Repper, 2000). Employment explained 2% of the variance in social inclusion though, implying that factors other than social functioning make a relatively larger contribution. Also, this cross-sectional study cannot rule out a reverse relationship whereby social inclusion predicts social function.

Higher depression symptomatology predicted lower social inclusion, and was the strongest individual predictor. The level of depressive symptomatology was clinically significant and similar to other FEP studies (Killackey, Jackson & McGorry, 2008). When compared to its relationship with other variables, the strength of association between social inclusion and depressive symptomatology raises the question of whether the former construct is actually a proxy measure of depression. There is longitudinal evidence that perceived social exclusion is related yet antecedent to depression in FEP (Iqbal et al., 2000), suggesting they may be distinct but overlapping constructs. Psychosocial interventions can prevent an acute depressive reaction to initial social losses in FEP from developing into chronic depression (Siris, 2000).

Social cognition did not predict social inclusion. The hypothesis that this proposed relationship was mediated by social functioning was not supported. Social cognitive domains other than those included may impact social inclusion. Attributional style (AS) is a subdomain characterising how people explain causes of events in their lives (Couture, Penn & Roberts, 2006). Few studies have examined AS in FEP, but there is tentative evidence for a tendency to blame others rather than situations for negative events in this population (Fornells–Ambrojo & Garety, 2009). AS may therefore have implications for perception of

social inclusion and interpersonal functioning in FEP. Higher social functioning may provide opportunities for corrective feedback regarding such AS, as well as directly impacting social inclusion. Hence social functioning may mediate the relationship between AS and social inclusion in FEP.

No effect of psychotic symptoms on social inclusion was found: employment may improve social inclusion in FEP regardless of symptomatology. This compliments evidence of a divergence between symptomatic and social outcomes in FEP (Morgan et al., 2014;Revier et al., 2015) and suggests disrupted education/employment during and after FEP onset may be more relevant to social exclusion than is psychotic symptomatology (Killackey et al., 2013b). People with FEP should therefore not be denied support to pursue vocational goals based on the assumption that symptoms will interfere (Holttum, 2013). Unemployment may negatively impact social inclusion in FEP despite symptomatic recovery (Morgan et al., 2014), and people with FEP are likely to disengage if interventions do not incorporate social inclusion through vocational achievement (Van Schalkwyk et al., 2015). Interventions such as Individual Placement and Support (Killackey et al., 2013a) may contribute to improved social function and inclusion, and enhanced treatment engagement in FEP.

Social Cognition

As hypothesized poorer facial emotion recognition predicted lower social functioning, replicating previous findings (Horan et al., 2012), but vocal emotion recognition did not. Facial emotion recognition may be more pertinent to social functioning than is vocal emotion recognition in psychosis (Hooker & Park, 2002). Negative symptomatology predicted lower social functioning, complimenting previous research (Ventura et al., 2009). Counter to prediction and previous findings (Fett et al., 2011), no ToM measure predicted social

functioning. Emotion recognition may more reliably predict social functioning than ToM in psychosis (Couture et al., 2006).

Strengths and Limitations

The large sample allowed adequate statistical power, and a range of variables were included. However, neither the SIS nor any social inclusion measure has undergone sufficient psychometric assessment (Coombs et al., 2013). Psychometrically sound measures must be developed and domains underlying this construct identified in FEP. There is also limited psychometric data for the included social cognitive measures (Pinkham et al., 2015). There is considerable developmental variation across the 15–25 age range, which may impact the included variables. Additional informants were not available to validate self-report data. Finally, causality cannot be inferred from these cross-sectional findings.

Conclusion

Social inclusion is related to better health/wellbeing, and becomes salient in adolescence (when FEP onset typically occurs). Illness onset can impede transitions to adulthood, yet social inclusion has scarcely been researched in early psychosis. This is one of the first studies to directly examine social inclusion in FEP. Role-specific social functioning (i.e., current employment) predicted greater social inclusion, and higher depression symptomatology predicted decreased social inclusion. Social functioning did not mediate the relationship between social cognition and social inclusion. There was no evidence for a relationship between psychotic symptomatology and social inclusion.

Statement of Ethical Standards

The Melbourne Health Human Research Ethics Committee approved this study (2007.648). Prospective participants met with study staff, who obtained written informed consent. Where appropriate, parental consent was obtained.

Conflict of Interest Statement

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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Tables

Table 1

Demographic, clinical, illness, and social characteristics of first-episode psychosis participants

Characteristic	Total sample (N = 146)		Minimum	Maximum
Demographic				
Gender (% female)	% (*n*)	30.82 (45)		
Age in years	*M (SD)*	20.49 (2.41)	15	25
Estimated premorbid IQ				
WRAT-4	*M (SD)*	92.40 (13.93)	57	140
Marital Status				
Never married	% (*n*)	97.30 (142)		
Country of birth				
Australian born	% (*n*)	76.10 (111)		
Education				
Current study status				
Not studying	% (*n*)	82.20 (120)		

Characteristic	Total sample (N = 146)		Minimum	Maximum
Studying	% (n)	17.80 (26)		
Highest year of school				
Years 7–9	% (n)	22.60 (33)		
Year 10	% (n)	18.5 (27)		
Year 11	% (n)	18.5 (27)		
VCE/VCAL	% (n)	40.40 (59)		
Employment				
Age at first job	*M (SD)*	15.70 (2.11)	10	23
Currently in paid work	% (n)	16.40 (24)		
Diagnosis of Psychotic Disorder				
Schizophrenia	% (n)	38.36 (56)		
Depression with Psychotic Features	% (n)	14.38 (21)		
Schizoaffective Disorder	% (n)	13.01 (19)		
Psychosis Not Otherwise Specified	% (n)	11.64 (17)		
Bipolar Disorder with Psychotic Features	% (n)	10.96 (16)		

Characteristic	Total sample (N = 146)		Minimum	Maximum
Schizophreniform Disorder	% (*n*)	5.48 (8)		
Delusional Disorder	% (*n*)	5.48 (8)		
Brief Psychotic Disorder	% (*n*)	0.68 (1)		
Duration of illness (months)				
Untreated psychosis	*M (SD)*	8.90 (16.11)	0	74
Time in service	*M (SD)*	8.52 (6.34)	0	36
Psychopathology				
BPRS-PS	*M (SD)*	8.53 (4.38)	4	20
SANS	*M (SD)*	25.48 (12.37)	2	66
CES-D	*M (SD)*	23.16 (10.65)	3	51
Medication				
Last 6 months prescribed:				
Antipsychotic	% (*n*)	86.30 (126)		
Other psychotropic	% (*n*)	39.04 (57)		
Social Cognition				

Characteristic	Total sample (N = 146)		Minimum	Maximum
ToM				
False Belief and Deception Stories	*M(SD)*	19.03 (4.77)	3	26
Picture Sequencing Task - False Belief	*M(SD)*	4.44 (1.37)	0.5	6
Hinting Task	*M(SD)*	14.47 (4.07)	0	20
Emotion Recognition				
DANVA-2-AF	*M(SD)*	6.17 (3.45)	0	17
DANVA-2-AP	*M(SD)*	7.83 (3.14)	1	18
Social Function				
SOFAS	*M(SD)*	51.47 (10.39)	30	80
Social Inclusion				
SIS	*M(SD)*	42.14 (6.98)	26	60

Note. *M* = mean; *SD* = standard deviation; *n* = number of participants; Minimum = minimum value; Maximum = Maximum value; WRAT-4 = Wide Ranging Achievement Test Reading Subtest standardized scores; BPRS-PS = Brief Psychiatric Rating Scale Psychotic Subscale score; SANS = Scale for the Assessment of Negative Symptoms score; CES-D = Centre for Epidemiological Studies – Depression Scale score; VCE = Victorian Certificate of Education; VCAL = Victorian Certificate of Applied Learning; ToM = Theory of Mind; DANVA-2-AF = Diagnostic Analysis of Nonverbal Accuracy – Adult Facial Expressions error score; DANVA-2-AP = Diagnostic Analysis of Nonverbal Accuracy – Adult Paralanguage error score; SOFAS = Social and Occupational Functioning Assessment Scale score; SIS = Social Inclusion Scale total score

Table 2

Summary of the enter hierarchical multiple regression model with SOFAS score as the outcome variable and demographics entered in block one, symptomatology entered in block two, and social cognition measures entered in block three as predictor variables

		Unstandardized					
Predictor Variable		²	b	SE_b	95%CI for b	*t*	R^2	$R^2_{\triangle}$
Block 1							.03	.03
	Gender	.04	.82	1.90	[-2.94, 4.58]	0.43		
	Age	-.09	-.40	0.37	[-1.12, 0.33]	-1.09		
	WRAT-4	.14	.11	0.06	[-.02, .23]	1.71		
Block 2							.36	.33
	Gender	.03	.56	1.57	[-2.54, 3.66]	0.36		
	Age	-.10	-.45	0.30	[-1.04, 0.15]	-1.49		
	WRAT-4	-.02	-.01	0.05	[-0.12, 0.09]	-0.26		
	BPRS-PS	-.13	-.30	0.21	[-0.71, 0.11]	-1.44		
	SANS	-.47	-.39	0.07	[-0.52, -0.27]	-6.08***		
	CES-D	-.15	-.14	0.08	[-0.29, 0.01]	-1.90		
Block 3							.40	.04
	Gender	-.01	-.15	1.60	[-3.31, 3.01]	-0.10		
	Age	-.10	-.42	0.30	[-1.01, 0.18]	-1.38		
	WRAT-4	<-.01	<-.01	0.06	[-0.12, 0.12]	-.03		
	BPRS-PS	-.17	-.40	0.21	[-0.81, 0.01]	-1.91		

		Unstandardized					
Predictor Variable	²	b	SE_b	95%CI for b	*t*	R^2	$R^2_{\triangle}$
SANS	-.45	-.38	0.07	[-0.51, -0.25]	-5.69***		
CES-D	-.15	-.15	0.08	[-0.30, <.01]	-1.94		
Stories	-.10	-.21	0.20	[-0.60, 0.17]	-1.09		
Hinting	-.01	-.01	0.23	[-0.47, 0.45]	-.06		
PSFB	-.10	-.74	0.60	[-1.92, 0.44]	-1.24		
DANVA-2-AF	-.22	-.66	0.25	[-1.14, -0.17]	-2.67**		
DANVA-2-AP	.02	.07	0.29	[-0.49, 0.64]	0.26		

Note. Outcome variable = Social and Occupational Functioning Assessment Scale (SOFAS) scores; *N* = 146; WRAT-4 = Wide Ranging Achievement Test Reading Subtest scores; BPRS-PS = Brief Psychiatric Rating Scale Psychotic Subscale scores; SANS = Scale for the Assessment of Negative Symptoms scores; CES-D = Centre for Epidemiological Studies – Depression Scale scores; Stories = False Belief and Deception Stories scores; Hinting = Hinting Task scores; PSFB = Picture Sequencing False Belief mean scores; DANVA-2-AF = Adult Facial Expressions error scores; DANVA-2-AP = Adult Paralanguage error scores; ² = standardized regression coefficient; b = unstandardized regression coefficient; SE_b = standard error for unstandardized regression coefficient; 95%CI for b = 95% confidence interval for unstandardized regression coefficients; *t* = t-score; R^2 = strength of model prediction; $R^2_{\triangle}$ = change in strength of model prediction.
** = $p < .01$; *** = $p < .001$

Table 3

Summary of the enter hierarchical multiple regression model with SIS score as the outcome variable and demographics entered in block one, symptomatology entered in block two, and SOFAS score entered in block three as predictor variables

		Unstandardized						
	Predictor Variable	²	b	SE_b	95%CI for b	*t*	R^2	$R^2_{\triangle}$
Block 1							<.01	<.01
	Gender	.02	.28	1.30	[-2.29, 2.85]	0.22		
	Age	.01	.01	0.25	[-0.48, 0.51]	0.06		
	WRAT-4	-.04	-.02	0.04	[-0.10, 0.06]	-0.48		
Block 2							.28	.28
	Gender	.03	.43	1.12	[-1.79, 2.64]	0.38		
	Age	-.01	-.03	0.22	[-0.45, 0.40]	-0.12		
	WRAT-4	-.16	-.08	0.04	[-0.16, <-.01]	-2.09*		
	BPRS-PS	-.02	-.03	0.15	[-0.32, 0.27]	-0.17		
	SANS	-.21	-.12	0.05	[-0.21, -0.03]	-2.58*		
	CES-D	-.44	-.29	0.05	[-0.4, -0.19]	-5.41***		
Block 3							.30	.03
	Gender	.02	.35	1.10	[-1.83, 2.53]	0.32		
	Age	.01	.04	0.21	[-0.38, 0.46]	0.18		
	WRAT-4	-.16	-.08	0.04	[-0.15, <-.01]	-2.07*		
	BPRS-PS	.01	.02	0.15	[-0.27, 0.31]	0.11		

		Unstandardized					
Predictor Variable	²	b	SE_b	95%CI for b	*t*	R^2	$R^2_{\triangle}$
SANS	-.11	-.06	0.05	[-0.17, .04]	-1.26		
CES-D	-.41	-.27	0.05	[-0.38, -0.17]	-5.05***		
SOFAS	.21	.14	0.06	[0.02, 0.26]	2.34*		

Note. Outcome variable = Social Inclusion Scale (SIS) score*; N* = 146; WRAT-4 = Wide Ranging Achievement Test Reading Subtest scores; BPRS-PS = Brief Psychiatric Rating Scale Psychotic Subscale scores; SANS = Scale for the Assessment of Negative Symptoms scores; CES-D = Centre for Epidemiological Studies – Depression Scale scores; SOFAS = Social and Occupational Functioning Assessment Scale scores; ² = standardized regression coefficient; b = unstandardized regression coefficient; SE_b = standard error for unstandardized regression coefficient; 95%CI for b = 95% confidence interval for unstandardized regression coefficients; *t* = t-score; R^2 = strength of model prediction; $R^2_{\triangle}$ = change in strength of model prediction.
* = $p < .05$; ** = $p < .01$; *** = $p < .001$

Table 4

Summary of the mediation enter hierarchical multiple regression with SIS score as the outcome variable, DANVA-2-AF error score as the predictor variable, SOFAS score as the mediator variable, and demographics, symptomatology, and current employment status as control variables

			Unstandardized					
	Predictor Variable	²	b	SE_b	95%CI for b	*t*	R^2	$R^2_{\triangle}$
Block 1							<.01	<.01
	Gender	.02	.28	1.30	[-2.29, 2.85]	0.22		
	Age	.01	.01	0.25	[-0.48, 0.51]	0.06		
	WRAT-4	-.04	-.02	0.04	[-0.10, 0.06]	-0.48		
Block 2							.28	.28
	Gender	.03	.43	1.12	[-1.79, 2.64]	0.38		
	Age	-.01	-.03	0.22	[-0.45, 0.40]	-0.12		
	WRAT-4	-.16	-.08	0.04	[-0.16, <-.01]	-2.09*		
	BPRS-PS	-.02	-.03	0.15	[-0.32, 0.27]	-0.17		
	SANS	-.21	-.12	0.05	[-0.21, -0.03]	-2.58*		
	CES-D	-.44	-.29	0.05	[-0.4, -0.19]	-5.41***		
Block 3							.28	<.01
	Gender	.03	0.49	1.14	[-1.75, 2.74]	0.43		
	Age	-.01	-0.03	0.22	[-0.46, 0.39]	0.16		
	WRAT-4	-.15	-.08	0.04	[-0.15, <0.01]	-1.94		
	BPRS-PS	-.02	-0.02	0.15	[-0.32, 0.27]	-0.16		

			Unstandardized					
	Predictor Variable	²	b	SE_b	95%CI for b	*t*	R^2	$R^2_{\triangle}$
	SANS	-.22	-0.12	0.05	[-0.22, -0.03]	-2.60*		
	CES-D	-.48	-.29	0.06	[-0.40, -0.18]	-5.19***		
	DANVA-2-AF	.03	0.07	0.16	[-0.25, 0.38]	0.41		
Block 4							.31	.03
	Gender	.03	0.48	1.12	[-1.38, 3.04]	0.43		
	Age	.01	0.02	0.21	[-0.40, 0.44]	0.11		
	WRAT-4	-.14	-0.07	0.04	[-0.15, 0.01]	-1.81		
	BPRS-PS	01	0.02	0.15	[-0.27, 0.31]	0.15		
	SANS	-.12	-0.07	0.05	[-0.17, 0.03]	-1.35		
	CES-D	-.40	-0.26	0.06	[-0.37, -0.15]	-4.71***		
	DANVA-2-AF	.07	0.14	0.16	[-0.18, 0.46]	0.85		
	SOFAS	.22	0.15	0.06	[0.03, 0.27]	2.45*		
Block 5							.33	.02
	Gender	.06	0.83	1.12	[-1.38, 3.04]	0.75		
	Age	.01	0.02	0.21	[-0.40, 0.44]	0.09		
	WRAT-4	-.15	-0.06	0.03	[-0.13, 0.01]	-1.82		
	BPRS-PS	.01	0.01	0.15	[-0.27, 0.30]	0.10		
	SANS	-.12	-0.07	0.05	[-0.17, 0.03]	-1.34		
	CES-D	-.43	-0.28	0.06	[-0.39, -0.17]	-5.03***		

		Unstandardized					
Predictor Variable	²	b	SE_b	95%CI for b	*t*	R^2	$R^2_{\triangle}$
DANVA-2-AF	.07	0.13	0.16	[-0.18, 0.45]	0.83		
SOFAS	.14	0.09	0.07	[-0.04, 0.22]	1.42		
Current Employment	.17	3.09	1.53	[0.07, 6.11]	2.02*		

Note. Outcome variable = Social Inclusion Scale (SIS) score*; N* = 146; WRAT-4 = Wide Ranging Achievement Test Reading Subtest score; BPRS-PS = Brief Psychiatric Rating Scale Psychotic Subscale score; SANS = Scale for the Assessment of Negative Symptoms score; CES-D = Centre for Epidemiological Studies – Depression Scale score; SOFAS = Social and Occupational Functioning Assessment Scale score; DANVA-2-AF = Adult Facial Expressions error score; ² = standardized regression coefficient; b = unstandardized regression coefficient; SE_b = standard error for unstandardized regression coefficient; 95%CI for b = 95% confidence interval for unstandardized regression coefficients; *t* = t-score.
*= $p < .05$; *** = $p < .001$

Appendix: details of the PROCESS script for mediation analysis

A conditional process approach to mediation analysis aims to explore the direct and indirect pathways via which variable *X* may transfer its effect on variable *Y* through an intermediate variable *M*. The PROCESS script (Hayes, 2013) can be used as an add-on that is implemented via syntax in SPSS. It uses an ordinary least squares regression approach to path analysis, which enables the estimation of direct and indirect effects in mediator models. One advantage of using the PROCESS script is that it uses sampling with replacement to generate a user-defined number of bootstrapped samples of confidence intervals around the indirect effect of *X* on *Y* through *M*. The default number of bootstrap samples is 1,000 but the researcher can specify this number. This removes the need to make assumptions about the shape of the sampling distribution of the indirect effect. The official documentation for the PROCESS script (and a full description of how it may be implemented in mediation and moderation hypotheses) can be found in the *Introduction to Mediation, Moderation, and Conditional Process Analysis* book by Hayes (2013).

Figure 1. Direct and indirect effects of DANVA-2-AF error score on SIS score via SOFAS score while controlling for other variables

Note. *N*=146; DANVA-2-AF = Adult Facial Expressions error score; SOFAS = Social and Occupational Functioning Assessment Scale score; Social Inclusion Scale (SIS) score; WRAT-4 = Wide Ranging Achievement Test Reading Subtest score; BPRS-PS = Brief Psychiatric Rating Scale Psychotic Subscale score; SANS = Scale for the Assessment of Negative Symptoms score; CES-D = Centre for Epidemiological Studies – Depression Scale score; Current employment = currently working for pay.
Numbers represent ^{2} (i.e., standardized regression coefficients)
* = $p < .05$; *** = $p < .001$