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Validation of the social functioning scale: Comparison and evaluation in early psychosis, autism spectrum disorder and social anxiety disorder

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ABSTRACT

Social functioning is an important component of mental disorders for assessment and treatment. There is no recognised self-report instrument to measure social functioning across disorders where social impairment is significant. The Social Functioning Scale (SFS) has, however, been used to assess social functioning in psychotic disorders, including Schizophrenia and Early Psychosis. The current study investigated the reliability, validity and sensitivity of the SFS in Early Psychosis, Autism Spectrum Disorder (ASD), Social Anxiety Disorder (SAD) and neurotypical control populations. As expected, all clinical groups showed significant impairment on the total and sub-scale scores of the SFS. The SFS showed good internal consistency and concurrent validity for people diagnosed with SAD and Early Psychosis and a similar factors structure was found for these groups. Participants with ASD reported a relatively low internal consistency and poor concurrent validity, as well as a three-component solution. The SFS has also showed a good sensitivity to separate clinical populations and neurotypical controls. This study supports the use of the SFS for those with SAD and Early Psychosis. Lower internal consistency in ASD populations suggests further research in larger samples is required and that the relationship between its scales are likely different to other populations. Alternative scales or significant other reports may be required for adults with ASD.

1. Introduction

Social functioning has been described as the integration of work or academic, interpersonal relations and self-care skills (Addington et al., 2003). Its importance has been increasingly highlighted as critical to mental well-being and social impairment, especially in psychiatric disorders characterized by social difficulties, including psychotic disorders, Autism Spectrum Disorders (ASD) and Social Anxiety Disorder (SAD). These psychiatric disorders share similar social difficulties including social avoidance, withdrawal and inability to participate social activities (Farrington, 1993). There is a need for reliable and valid assessments of social functioning that can be easily administered in clinical services.

There are a number of scales which have been widely used among psychotic populations in both research and clinical settings, such as the Social Functioning Scale (SFS; Birchwood et al., 1990) and the Global Functioning Scale (Cornblatt et al., 2007). In particular, the SFS was developed for individuals diagnosed with Schizophrenia and has become one of the most widely used instruments for assessing functioning in psychotic populations (Burns and Patrick, 2007). It consists of seven subscales: (1) social engagement/withdrawal (amount of time to spend alone, the likelihood to initiate conversation); (2) interpersonal behaviour (number of friends, engagement in a romantic relationship); (3) prosocial activities (participation in social activities e.g. visit friends, play sports); (4) recreation (engagement in activities and hobbies); (5) independence-competence (ability to maintain independent living); (6) independence-performance (performance of the skills required for independent living); (7) employment/occupation (engagement in employment), although the total score is typically used to provide an overall social functioning level. For psychotic populations, this scale demonstrates excellent psychometric properties in terms of reliability, validity and sensitivity (Birchwood et al., 1990) and it has been translated into different language versions (Hellvin et al., 2010; Iffland et al., 2015; Morejon and Ga-Boveda, 2000; Nemoto et al., 2008; Torres and Olivares, 2005). Different versions of the SFS have demonstrated good internal consistency, moderate inter-correlations, good concurrent validity with measures such as the Global Assessment of Functioning (GAF), Disability Assessment Schedule (DAS-M) and World Health Organization Disability Assessment Schedule 2.0 (WHODAS-2), and have satisfactory sensitivity

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in discriminating between controls and schizophrenia participants (Birchwood et al., 1990; Hellvin et al., 2010; Iffland et al., 2015; Morejon and Ga-Boveda, 2000). Furthermore, past literature has suggested a two-component solution in Schizophrenia groups by using principal component analyses (Hellvin et al., 2010; Iffland et al., 2015). The two components found by Hellvin et al. (2010) suggested employment as the second component whereas the second factor found by Iffland et al. (2015) included independence and employment.

The scale has provided useful insights into psychotic populations. For example, past studies using this scale have showed that decline in social functioning is typically observed before the onset of initial psychosis (Tohen et al., 2000; Welham et al., 2008). Research has also shown that deterioration of social functioning as assessed by the SFS is independent from the severity of psychotic symptoms (Tohen et al., 2000; Welham et al., 2008), and is persistent throughout the course of illness (Addington et al., 2003). Despite the popularity of the SFS, however, there has been limited application of the SFS to other disorders characterized by social impairment, such as ASD and SAD.

To date, there is no self-report instrument designed to directly measure social functioning in ASD patients. Most of the existing scales assess individual components of social functioning such as social skills, communication skills, and emotion identification, using instruments such as the Social Skills Inventory, the Autism-spectrum Quotient, and the Empathy Quotient (Tobin et al., 2014). While the World Health Organization Disability Assessment Schedule 2.0 (WHODAS-2;World Health Organization, 1999) also measures disability in terms of functioning and participation in daily activities, the items on the questionnaire do not target many components of social functioning (Garin et al., 2010; McKnight et al., 2016). Similarly, the Vineland Adaptive Behaviour Scale evaluates adaptive functioning, but the measure itself is much broader in its scope and usually requires a clinical interview (Pepperdine and McCrimmon, 2017).

For people diagnosed with SAD, scales typically target social anxiety symptoms, such as fear and avoidance (e.g. Liebowitz Social Anxiety Scale LSAS; Liebowitz, 1987), but there are no recognised instruments to assess social functioning (Davila and Beck, 2002; Wittchen et al., 2000). The Social and Occupational Functioning Assessment Scale (SOFAS; American Psychiatric Association, 2000) is sometimes used as a clinical assessment of social functioning, but it relies on a global rating and lacks detail for assessing performance in domains or tasks relevant for social functioning.

The SFS could provide a tool to assess social functioning in adults with ASD and SAD, to aid treatment planning and prognosis prediction. The aim of the current study was to: (1) to compare SFS scores across treatment-seeking participants diagnosed with Early Psychosis, ASD, and SAD and also to neurotypical control participants and (2) to examine the psychometric properties of the SFS across the sample and within each diagnosis. Based on previous reports (Birchwood et al., 1990; Hellvin et al., 2010; Iffland et al., 2015; Morejon and Ga-Boveda, 2000), it was predicted that the scale would show good internal consistency for the full-scale score and sub-scale scores in clinical samples and neurotypical controls. Inter-correlations between the SFS full scale and subscales were expected to be moderate and we also expected significant correlations between the SFS and other functional measures, including the SOFAS and WHODAS-2, in all clinical groups. A two-component solution in the principal component analyses was predicted in the early psychosis group. Similar factor solution was expected for ASD, SAD and neurotypical controls. Finally, we predicted the scale to show good sensitivity in discriminating between clinical and control populations.

2. Methods

2.1. Sample

This study included consecutively recruited 155 treatment-seeking participants diagnosed with Early Psychosis (n = 48), ASD (n = 53) and SAD (n = 54). Clinical participants presented to the University of Sydney *Headspace* youth mental health service located in Camperdown, Sydney, and the collocated Anxiety and Autism Clinics of the University of Sydney. All participants were invited to the Brain and Mind Centre, University of Sydney to conduct assessments. Assessments were completed by clinical psychologists and trained research assistants. For those diagnosed with ASD, participants met clinical cut-off on The Autism Diagnostic Observation Schedule - 2nd edition (ADOS-2; Lord et al., 2012) and a clinical interview based on the Diagnostic and Statistical Manual – Fifth Edition (DSM-V; American Psychiatric Association, 2013). Participants meeting criteria for SAD completed the Anxiety Diagnostic Interview Schedule - Revised (ADIS-R; Brown et al., 1994) and DSM-V criteria. Participants were excluded from the ASD and SAD groups if they presented any psychotic symptoms. Participants meeting criteria for Early Psychosis completed the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First and Gibbon, 2004). In addition, 59 neurotypical control participants were recruited through advertisement and invited to participate. Neurotypical participants must not have a past or current mental health diagnosis. They were also screened by using the Depression, Anxiety and Stress Scale (DASS-21; Lovibond and Lovibond, 1995), the Social Interaction Anxiety Scale (SIAS; Heimberg et al., 1992), or the Autism Quotient (AQ-10; Allison et al., 2012). Individuals who scored above clinical cut-offs on the scales were excluded from the neurotypical group. Informed consent was provided to clinical psychologists at the diagnostic assessment for screening and ethics was approved by the University of Sydney Human Research Ethics Committee (2013/352). Participants were not included in the study if they met one of the following exclusion criteria: intellectual disability, major neurological disorder, major medical illness, history of sustained head injury, undergone electroconvulsive therapy (ECT) within last 3-months and unable to speak or read English fluently.

2.2. Materials

2.2.1. The social functioning scale

The Social Functioning Scale (SFS) is a self-report questionnaire initially designed for people diagnosed with Schizophrenia (Birchwood et al., 1990). It consists of 79 items designed to reflect the social skills and performances of patients. The administration of the SFS has been combined with dichotomous questions and Likert scales on the frequency and ability to perform social activities. The items have been segregated in seven subscales as previously described. The sum of each subscale has been standardized and normalized into a scaled score based on a sample of 334 individuals with Schizophrenia (Birchwood et al., 1990), with a mean of 100 and standard deviation of 15. The sum of the scaled scores of seven subscales was the SFS full scaled score. Higher scaled scores represent a better social functioning level and frequency of behaviour.

2.2.2. Social and occupational functioning assessment scale

The Social and Occupational Functioning Assessment Scale (SOFAS; American Psychiatric Association, 2000) is rated according to the clinician or researcher's judgement on participant's overall functioning. Social and occupational functioning were considered and rated in a single score ranging from 0 to 100. The continuum represented the impairment from grossly impaired functioning to excellent functioning. Physical limitations and mental impairments were considered when rating overall functional level.

2.2.3. World health organization disability assessment schedule 2.0

The World Health Organization Disability Assessment Schedule 2.0 (WHODAS-2; World Health Organization, 1999) was a self-report which contained 36 items to reflect disability burden of mental and physical health problems. Ratings were based on the activities and performances for the past 30 days. Seven domains were covered: (1) understanding

and communicating, (2) getting around, (3) self-care, (4) getting along with others, (5) life activities: household, (6) life activities: work/school and (7) participation in society. Each domain was transformed into a single score in a range from 0 to 100, in which the higher number reflected higher level of disability. The WHODAS-2 has been greatly used in psychotic, developmental and mood disorders (de Graaf et al., 2008; Penninx et al., 2008; Williams et al., 2007). We have reported good psychometric properties of the WHODAS-2 in autistic populations elsewhere (Park et al., under review).

2.2.4. Wechsler test of adult reading

The Wechsler test of adult reading (WTAR; Wechsler, 2001) was designed to measure premorbid intellectual functioning. WTAR consisted of 50 irregularly spelled words for participants to read aloud. Each correct pronunciation gave one score, with a maximum raw score of 50. Raw score was then converted to age-adjusted standard score, which could be used as predicted IQ ($M = 100$, $SD = 50$).

2.3. Data analyses and statistics

Data analyses were carried out using the IBM Statistical Package for the Social Sciences Version 23. Demographic variables were analysed using chi-square (χ^2) for categorical data and analysis of variance (ANOVA) or Kruskal–Wallis H test for continuous data. Effect sizes were calculated by squared-eta correlation coefficients (η^2) when adequate. Scheffe's post-hoc analysis or Mann–Whitney U test were completed to compare the differences between groups. Then, differences in the SFS subscale and full scaled scores between clinical groups were investigated by analysis of covariance (ANCOVA) and Scheffe's post-hoc tests. Squared-eta correlation coefficients (η^2) were reported. Next, reliability analyses were performed by testing (1) internal consistency using Cronbach's alpha for the full scale and seven subscales in the whole sample and each clinical group, (2) mean item-total correlation, (3) mean inter-item correlation and (4) inter-correlations with the Spearman's correlation coefficients (r) between the full scale and each subscale. Group comparisons of the inter-correlations of the SFS were completed by Fisher's r-to-z transformation. Reliability analyses were firstly done with the whole sample and repeated in each clinical group. Further, concurrent validity of the SFS was examined by running bivariate Spearman's correlation coefficients (r) between the SFS for continuous variables such as baseline variables, WHODAS-2 and SOFAS. One-way ANOVAs were also conducted to reveal differences between categorical variables. Moreover, principal component analyses with Varimax rotation (eigenvalues ≥ 1.0) was performed to assess the factor structure of the SFS. Five separate analyses were conducted by analysing the whole sample and each individual group. Further, sensitivity of the SFS was tested by running the discriminant analyses based on the seven subscales. Analyses were performed to classify clinical group from neurotypical control as well as between each clinical group. Finally, a frequency analysis was also done to scrutinize floor and ceiling effects. All analyses used a significance alpha level of 0.05.

3. Results

Group comparisons on demographic characteristics and functional measures are showed in Table 1. Non-parametric tests were conducted for variables including age, predicted IQ, years of education and SOFAS after testing for normality by using the Shapiro–Wilk Test. Kruskal–-Wallis test results showed that the groups were significantly different in age, predicted IQ and years of education. Chi-square analysis also revealed there were significant differences in occupation status and living status. Furthermore, all clinical groups scored significantly lower than neurotypical controls on the SOFAS. Participants diagnosed with Early Psychosis scored significantly lower than ASD on the SOFAS, whereas ASD participants scored significantly lower than those diagnosed with SAD. All clinical groups did not differ significantly from each other on the WHODAS-2 but reported significantly greater disability compared to neurotypical controls.

Table 1
Demographic characteristics, functional measures and group comparisons.

	EP (n = 48)	ASD (n = 53)	SAD (n = 54)	NT (n = 60)	Group comparisons
Sex, n (%)					$\chi^2_{(3,n=215)} = 7.74$, $p = .26$
Male	30 (62.50)	36 (67.90)	27 (50.00)	33 (55.00)	
Female	18 (37.50)	16 (30.20)	27 (50.00)	27 (45.00)	
Age in years, M (SD)	21.90 (4.43)	23.83 (6.69)	22.31 (6.10)	24.77 (5.30)	$\chi^2(3) = 13.40$, $p < .01$**, [EP, SAD, ASD, NT]
Predicted IQ, M (SD)	101.54 (9.42)	105.87 (9.84)	110.87 (7.14)	107.82 (7.74)	$\chi^2(3) = 31.17$, $p < .01$**, [EP < ASD, NT < SAD]
Occupation Status, n (%)					$\chi^2_{(3,n=215)} = 26.03$, $p < .01$**
Student	22 (45.80)	21 (39.60)	26 (48.10)	40 (66.70)	
Employed	8 (16.70)	11 (20.80)	15 (27.80)	18 (30.00)	
Volunteer/Not Working	3 (6.30)	4 (7.50)	2 (3.70)	0 (0)	
Unemployed	15 (31.30)	17 (32.10)	11 (20.40)	2 (3.30)	
Marital Status, n (%)					$\chi^2_{(3,n=215)} = 9.17$, $p = .42$
Never Married	47 (97.90)	50 (94.30)	51 (94.40)	55 (91.70)	
Married/De Facto	1 (2.10)	3 (5.70)	2 (3.70)	3 (5.00)	
Separated	0 (0)	0 (0)	0 (0)	2 (3.30)	
Divorced	0 (0)	0 (0)	1 (1.90)	0 (0)	
Living Status, n (%)					$\chi^2_{(4,n=215)} = 33.69$, $p < .01$**
Home Alone	4 (8.30)	7 (13.20)	3 (5.60)	10 (16.70)	
Shared Accommodation	13 (27.10)	13 (24.50)	13 (24.10)	32 (53.30)	
Partially Supported	9 (18.80)	6 (11.30)	5 (9.30)	8 (13.30)	
Dependent	19 (39.60)	24 (45.30)	32 (59.30)	9 (15.00)	
Other	3 (6.30)	3 (5.70)	1 (1.90)	1 (1.70)	
Years of Education, M (SD)	12.15 (2.20)	12.74 (2.01)	12.70 (1.85)	14.43 (2.15)	$\chi^2(3) = 30.18$, $p < .01$**, [EP, SAD, ASD < NT]
SOFAS, M (SD)	56.35 (9.31)	62.40 (7.34)	65.41 (6.15)	88.12 (4.60)	$\chi^2(3) = 143.43$, $p < .01$** [EP < ASD < SAD < NT]
WHODAS-2, M (SD)	35.28 (14.82)	34.75 (20.14)	34.03 (15.22)	7.97 (7.96)	$F_{(1,n=215)} = 45.77$, $p < .01$**, $\eta^2 = 0.39$ [NT < SAD, ASD, EP]

Note. n or M (SD) are reported. Chi-square analysis (χ^2) for categorical data; ANOVA (F) and eta correlation coefficients ($\eta 2$) for normally distributed continuous data; Kruskal–Wallis H test (χ^2) for non-parametric continuous data are reported. EP: Early Psychosis, ASD: Autism Spectrum Disorder, SAD: Social Anxiety Disorder, NT: Neurotypical controls, SOFAS: Social and Occupational Functioning Assessment Scale, WHODAS-2: World Health Organization-Disability Assessment Schedule (2.0).
*$p < .05$.
** $p < .01$.

Table 2
Group comparisons of standardized scores on the Social Functioning Scale (SFS).

	EP (n = 48)	ASD (n = 53)	SAD (n = 54)	NT (n = 60)	Group comparison
(1) Withdrawal	97.78 (10.24)	94.47 (11.17)	93.90 (8.12)	108.33 (11.98)	$F_{(3,n=215)} = 9.57$, $p < .001^{***}$, $\eta^2 = 0.27$ [SAD, ASD, EP < NT]
(2) Interpersonal	115.33 (19.53)	106.55 (17.27)	107.82 (15.33)	137.70 (13.64)	$F_{(3,n=215)} = 18.86$, $p < .001^{***}$, $\eta^2 = 0.42$ [ASD, SAD, EP < NT]
(3) Prosocial	108.03 (16.57)	101.17 (16.61)	103.41 (12.05)	122.28 (10.53)	$F_{(3,n=215)} = 14.06$, $p < .001^{***}$, $\eta^2 = 0.35$ [ASD, SAD, EP < NT]
(4) Recreation	104.48 (16.59)	105.09 (18.44)	100.14 (12.87)	116.96 (12.67)	$F_{(3,n=215)} = 8.11$, $p < .001^{***}$, $\eta^2 = 0.24$ [SAD, EP, ASD < NT]
(5) Independence-Competence	109.59 (11.73)	102.94 (20.44)	107.58 (11.74)	119.81 (6.66)	$F_{(3,n=215)} = 9.18$, $p < .001^{***}$, $\eta^2 = 0.26$ [ASD, SAD, EP < NT]
(6) Independence-Performance	102.04 (12.81)	98.29 (23.72)	102.49 (13.07)	117.99 (18.88)	$F_{(3,n=215)} = 8.00$, $p < .001^{***}$, $\eta^2 = 0.24$ [ASD, EP, SAD < NT]
(7) Employment/Occupation	112.99 (9.87)	108.53 (12.06)	112.62 (10.43)	120.62 (3.56)	$F(3,_{n=215}) = 23.94$, $p < .001^{***}$, $\eta^2 = 0.48$ [ASD, SAD, EP < NT]
Full Scale	107.18 (10.16)	102.83 (8.68)	103.99 (8.03)	120.78 (6.09)	$F_{(3,n=215)} = 30.92$, $p < .001^{***}$, $\eta^2 = 0.55$ [ASD, SAD, EP < NT]

Note. Mean (M) and standard deviation (SD) are presented. Group comparisons made with ANCOVA (covariates with age, predicted IQ, years of education) and eta-correlation coefficients ($\eta 2$) are reported. EP: Early Psychosis, ASD: Autism Spectrum Disorder, SAD: Social Anxiety Disorder, NT: Neurotypical controls.
$^{*}p < .05$.
$^{**}p < .01$.
$^{***}p < .001$.

Table 3
Distribution of scores on the Social Functioning Scale (SFS) full scale.

SFS full scale score	EP (n = 48)		ASD (n = 53)		SAD (n = 54)		NT (n = 60)	
	n	%	n	%	n	%	n	%
76–85	1	2.10	2	3.80	–	–	–	–
86–95	8	16.70	5	9.40	11	20.40	–	–
96–105	9	18.80	27	50.90	18	33.30	1	1.70
106–115	21	43.80	15	28.30	22	40.70	11	18.30
116–125	8	16.70	4	7.50	3	5.60	35	58.30
126–135	1	2.10	–	–	–	–	13	21.70

Note. EP: Early Psychosis, ASD: Autism Spectrum Disorder, SAD: Social Anxiety Disorder, NT: Neurotypical controls.

3.1. Group comparisons

ANCOVA results for the group comparisons of SFS are summarised in Table 2. There were significant differences between clinical groups and neurotypical controls on the SFS full scale and all subscales. Neurotypical controls consistently performed significantly better on all social functioning domains than Early Psychosis, ASD and SAD. The clinical groups did not differ significantly across all subscales. According to the normative mean (scaled score = 100) set by Birchwood et al. (1990), Early Psychosis rated themselves 7 scaled scores above the mean on the SFS full scale, whereas ASD and SAD rated themselves 2 and 3 scaled scores above the mean, respectively. Neurotypical controls on the other hand, were 20 scaled scores above the mean.

A frequency analysis was conducted to investigate the distribution of scores in each group (Table 3). The same score range was used in Birchwood et al. (1990). Neurotypical controls clustered at a higher median than all clinical groups (Md = 120.68). The median of ASD and SAD were in the score range of 96–105 (ASD: Md = 103.14; SAD: Md = 104.75). The median of Early Psychosis was in the score range of 106–115 (Md = 109.36). None of the ASD and SAD participants obtained scores at the highest range (126–135) and one Early Psychosis subject scored in that range.

3.2. Reliability

3.2.1. Internal consistency

Cronbach's alpha for the whole sample was 0.82 on the full scale, and ranged from 0.57 to 0.93 on each subscale. For Early Psychosis, Cronbach's alpha of the SFS full scale was 0.84 and subscales ranged between 0.55 and 0.87. Cronbach's alpha for ASD participants was 0.56 and the subscales ranged between −0.12 and 0.95. The alpha level for the interpersonal subscale ($\alpha = -0.12$) and withdrawal subscale ($\alpha = 0.39$) were particularly low. For SAD, Cronbach's alpha for the SFS full scale was 0.79, whereas the subscales ranged from 0.59 to 0.82, except for the Withdrawal subscale ($\alpha = 0.33$).

3.2.2. Item-total correlations

The mean item-total correlations ranged from 0.34 to 0.69 on the subscales and 0.58 on the full scale for the whole sample. For the clinical groups, the mean item-total correlations of the SFS full scale was 0.60 in Early Psychosis, 0.30 in ASD and 0.52 in SAD. The correlations between subscales varied between 0.31 and 0.54, −0.03 to 0.76 and 0.16 to 0.46 in Early Psychosis, ASD and SAD respectively.

3.2.3. Inter-item correlations

The mean inter-item correlations in whole sample varied between 0.21 and 0.51 within the subscales, and was 0.58 for the full scale. Early Psychosis had a mean inter-item correlation of 0.43 in full scale scores that ranged between 0.18 and 0.47 on subscales. ASD participants obtained 0.16 on full scale scores and ranged from −0.03 to 0.61 on subscales. SAD varied between 0.08 and 0.33 and scored 0.35 on the full scale.

3.2.4. Inter-correlations

The bivariate correlation coefficients between the SFS full scale and seven subscales were calculated using the whole sample. The full scale correlated over 0.59 with all subscales, which provided evidence that SFS measures a single composite score. Among the seven subscales, (3) Prosocial, (5) Independence-Competence and (7) Employment/Occupation had lower levels of inter-correlation compared with other subscales. The SFS full scale was significantly correlated to each of the subscales in all clinical groups. The correlation coefficients ranged between 0.55 to 0.86, 0.33 to 0.62 and 0.49 to 0.74 in Early Psychosis, ASD and SAD respectively.

Fisher's r-to-z transformation further revealed the strength of inter-correlations by comparing between the clinical populations. The inter-correlation between the (1) Withdrawal subscale and full scale SFS was significantly stronger in the Early Psychosis group than the SAD group ($z = 2.02$, $p < .05$). For the Interpersonal subscale, the inter-correlation of the Early Psychosis group was significantly stronger than the ASD ($z = 2.77$, $p < .01$) and neurotypical group ($z = 2.77$, $p < .01$). For the (4) Recreation subscale, the SAD group had a stronger inter-correlation than the ASD group ($z = 2.06$, $p < .05$).

3.3. Validity

3.3.1. Concurrent validity

The SFS full scale correlated significantly with WHODAS-2 in all clinical groups (Early Psychosis: $r = -0.49$, $p < .01$; ASD: $r = -0.29$, $p < .05$; SAD: $r = -0.39$, $p < .01$). Moreover, SFS full scale also correlated with SOFAS in Early Psychosis ($r = 0.50$, $p < .01$) and SAD ($r = 0.42$, $p < .01$). The correlation between the SFS full scale and SOFAS suggested a trend for ASD participants ($r = 0.25$, $p = .09$).

Table 4
Principal component analyses of seven Social Functioning Scale (SFS) subscales.

	Total Sample (n = 215)	EP (n = 48)			ASD (n = 53)				SAD (n = 54)			NT (n = 60)		
	Unrotated F1	Unrotated F1	Rotated F1	F2	Unrotated F1	Rotated F1	F2	F3	Unrotated F1	Rotated F1	F2	Unrotated F1	Rotated F1	F2
(1) Withdrawal	0.76	0.79	**0.63**	**0.48**	0.66	0.22	**0.84**	−0.13	0.61	**0.83**	0.03	0.78	**0.76**	0.33
(2) Interpersonal	0.78	0.81	**0.59**	**0.56**	0.46	−0.07	**0.84**	0.05	0.70	**0.80**	0.19	0.49	**0.77**	−0.09
(3) Prosocial	0.83	0.70	**0.83**	0.22	0.67	**0.49**	**0.41**	**0.45**	0.75	**0.69**	0.37	0.58	**0.74**	0.18
(4) Recreation	0.68	0.65	**0.70**	0.29	−0.03	**0.89**	0.15	−0.13	0.68	**0.44**	**0.40**	0.49	0.24	**0.48**
(5) Independence-Competence	0.59	0.72	0.07	**0.92**	0.78	0.00	−0.21	**0.76**	0.59	0.17	**0.79**	0.51	0.02	**0.68**
(6) Independence-Performance	0.68	0.77	0.19	**0.86**	0.69	**0.89**	−0.05	0.05	0.75	0.29	**0.77**	0.66	0.22	**0.61**
(7) Employment/Occupation	0.63	0.57	**0.82**	−0.09	0.15	−0.04	0.12	**0.84**	0.58	0.07	**0.75**	0.52	−0.02	**0.76**
Eigenvalue	3.53	3.64	2.64	2.27	2.21	1.88	1.67	1.52	3.13	2.12	2.11	2.37	1.82	1.79
% variance explained	50.43	51.97	37.74	32.39	31.54	26.89	23.81	21.68	44.69	30.22	30.14	33.88	25.98	25.61
Cum.% variance explained	50.43	51.97		70.13	31.54		50.70	72.37	44.69		60.36	33.88		51.59

Note. Reported factor loadings from the unrotated first component, and factor loadings from the rotated components when more than one was indicated (eigenvalue >1.0, Varimax rotation). EP: Early Psychosis, ASD: Autism Spectrum Disorder, SAD: Social Anxiety Disorder, NT: Neurotypical controls.

3.4. Factor structure

One single component-solution with all subscales was found for the total sample from the results of the principal component analyses (Table 4). All subscales loadings were above 0.59, explaining 50.4% of variance. The subscale (5) Independence-Competence (0.59) and (7) Employment (0.63) obtained the lowest factor loadings but were not small enough for an additional component. Separate analyses were performed for each group. A two-component solution was found in Early Psychosis. Both factors (eigenvalue ≥1) accounted for 70.13% in total. The first unrotated component explained 51.97% of the variance and consisted of (1) Withdrawal, (2) Interpersonal, (3) Prosocial, (4) Recreation and (7) Employment/Occupation. The second rotated component contained the four subscales, (1) Withdrawal, (2) Interpersonal, (5) Independence-Competence and (6) Independence-Performance.

For ASD, three rotated components explained 70.37% variance in total. The first rotated component included 4 subscales which were (3) Prosocial and (4) Recreation and (6) Independence-Performance. The second rotated component contained subscales (1) Withdrawal, (2) Interpersonal, (3) Prosocial, whereas the third rotated component consisted of subscales (3) Prosocial, (5) Independence-Competence and (7) Employment/Occupation. The unrotated first component explained 31.54% of the variance.

For SAD, two components with eigenvalue ≥1 were found. The first unrotated component explained 44.69% of the variance. The two rotated components accounted for 60.36% variance in total. The first rotated component consisted of four subscales: (1) Withdrawal, (2) Interpersonal, (3) Prosocial, (4) Recreation, and the second rotated component consisted of four subscales: (4) Recreation, (5) Independence-Competence, (6) Independence-Performance, (7) Employment/Occupation.

3.5. Sensitivity

Discriminant analyses were performed to examine the sensitivity of the SFS in case level. The first analysis examined the sensitivity of the SFS in identifying the clinical group from neurotypical controls. It was shown that the SFS classified 89.0% of participants in the clinical group and 76.7% neurotypical controls correctly (Wilks Lambda = 0.55, χ^2 (7) = 122.63, $p < .05$). The second analysis examined how the SFS identified the clinical groups. It showed that 43.8%, 43.4% and 53.7% of Early Psychosis, ASD and SAD participants could be correctly assigned respectively. However, the discriminant functions did not reach significance (Function 1: Wilks Lambda = 0.86, χ^2 (14) = 22.77, $p = .06$, Function 2: Wilks Lambda = 0.95, χ^2 (6) = 7.84, $p = .25$).

4. Discussion

This study examined the psychometric properties of the SFS in people diagnosed with Early Psychosis, ASD and SAD. Reports of social functioning by people diagnosed with Early Psychosis, ASD and SAD confirmed significant impairment in comparison to neurotypical controls participants. As expected, all clinical groups reported significant deficits on all seven subscales compared to the neurotypical population and there were no significant differences between clinical groups across social domains. Examination of psychometric properties showed that the SFS was a reliable, valid and sensitive instrument for those with SAD, and results also replicated the positive psychometric results for patients with Early Psychosis (Birchwood et al., 1990; Hellvin et al., 2010; Iffland et al., 2015; Morejon and Ga-Boveda, 2000). However, the SFS did not show a satisfactory internal consistency for the ASD group and the factors structure differed significantly from the other groups (Tavakol and Dennick, 2011). This may reflect differences in the way people diagnosed with ASD conceptualise significant social relationships and, therefore, how they report on the quality of these relationship (Hudson et al., 2012).

In our study, we considered mean item-total correlations above 0.2, mean inter-item correlations between 0.15 and 0.50 and Cronbach's alpha above 0.7 as appropriate. The poor internal consistency for the interpersonal subscale of the ASD group (α = −0.012) might be accounted by the common social cognitive deficit observed in the ASD population (Tobin et al., 2014). Individuals with ASD may have limited capacity to understand social relations (Hudson et al., 2012). That is, they may perceive different meanings of friendships compared to their neurotypical counterparts and potentially inflate the significance of more limited friendships (Petrina et al., 2014). For example, while children with ASD primarily describe friendship as companionship, typically developed children further report the elements of self-disclosure, loyalty, and intimacy. It might be that these qualitative differences in the maintenance of social relationships by people with ASD results in differences in self-evaluations of functioning as assessed on these scales. Scales that report more objective and behavioural functioning outcomes may have more utility.

The mean item-total and mean inter-item correlations in each clinical group were similar to those in the previous studies (Iffland et al., 2015; Morejon and Ga-Boveda, 2000). The Early Psychosis group reported appropriate mean item-total and mean inter-item correlations. Both ASD and SAD group showed acceptable mean item-total and mean inter-item correlations (Bernstein and Nunnally, 1994; Wieland et al., 2017). The mean item-total and mean inter-item correlations of the clinical groups were comparable to other validation studies of SFS

Table 5
The Social Functioning Scale.

The Social Functioning Scale– SFS

Part A

1. What time do you get up each day?

Average weekday ……. am/pm Average weekend (if different) …….. am/pm

2. On average, how many waking hours do you spend alone in one day:

e.g. alone in a room …… walking out alone …….

listening to radio or watching TV alone etc …….. ……..

Please tick one of the boxes:

0-3 hours	Very little spent alone	
3-6 hours	Some of time	
6-9 hours	Quite a lot of the time	
9-12 hours	A great deal of time	
12 hours	Practically all the time	

3. How often will you start a conversation at home?

Almost never	Rarely	Sometimes	Often

4. How often do you leave the house (for any reason)?

Almost never	Rarely	Sometimes	Often

5. How do you react to the presence of strangers/people that you don't know?

Avoid them	
Feel nervous	
Accept them	
Like them	

Part B

1. How many friends do you have at the moment? ☐

(*continued on next page*)

Table 5 (*continued*)

Validation of the Social Functioning Scale

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(people who you see regularly, do activities with etc.)

2. Do you have a partner?

Yes	
No	

3. How often are you able to carry out a sensible or rational conversation?

Please tick a box

Almost never	
Rarely	
Sometimes	
Often	

4. How easy or difficult do you find it talking to people at the moment?

Very easy	
Quite easy	
Average	
Quite difficult	
Very difficult	

Part C

Please place a tick against each item to show how often you have done the following **over the past 3 months.**

	Never	Rarely	Sometimes	Often
Buying items from the shops (without help)				
Washing pots, tidying up etc.				
Regular washing, bathing etc.				
Washing own clothes				
Looking for a job/working				
Doing the food shopping				
Prepare and cook a meal				
Leaving the house alone				
Using buses, trains etc.				
Using money				
Budgeting				
Choosing and buying clothes for self				
Take care of personal appearance.				

Part D

Please place a tick in the appropriate column to indicate how often you have done any of the following activities **over the past 3 months.**

	Never	Rarely	Sometimes	Often
Playing musical instruments				
Sewing, knitting				
Gardening				
Reading things				
Watching television				
Listening to records or radio				
Cooking				

(*continued on next page*)

Table 5 (*continued*)

Validation of the Social Functioning Scale

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D.I.Y activities (e.g. putting up shelves)				
Fixing things (car, bike, household etc).				
Walking, rambling				
Driving\cycling (as a recreation)				
Swimming				
Hobby (e.g. collecting things)				
Shopping				
Artistic activity (painting, crafts etc.)				

Part E

Please place a tick in the appropriate column to indicate how often you have done any of the following activities **over the past 3 months.**

	Never	Rarely	Sometimes	Often
Cinema				
Theatre\Concert				
Watching an indoor sport (squash, table-tennis).				
Watching an outdoor sport (football, rugby).				
Art gallery\ museum.				
Exhibition.				
Visiting places of interest.				
Meetings, talks etc.				
Evening Class.				
Visiting relatives in their homes.				
Being visited by relatives.				
Visiting friends (including boy/girlfriends).				
Parties.				
Formal occasions.				
Disco etc.				
Nightclub\ Social club				
Playing an indoor sport.				
Playing an outdoor sport.				
Club\ Society.				
Pub.				
Eating Out.				
Church Activity.				

Part F

Please place a tick against each item to show how able you are at doing or using the following.

	Adequately	Needs Help	Unable	Don't know
Public transport				
Handling money.				
Budgeting.				
Cooking.				
Weekly shopping.				
Looking for a job/ in				

(*continued on next page*)

Table 5 (*continued*)

Validation of the Social Functioning Scale

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employment				
Washing own clothes.				
Personal hygiene.				
Washing, tidying etc.				
Purchasing from shops.				
Leaving the house alone.				
Choosing and buying clothes.				
Caring for personal appearance.				

Part G

Are you in regular employment?
(This includes industrial therapy, rehabilitation or retraining courses).

Yes	
No	

1) **IF YES**: What sort of job? ……..

How many hours do you work per week? …….

How long have you had this job? ……

2) **IF NO**: When were you last in employment? ……..

What sort of job was it? …….

How many hours per week? ……...

Are you registered disabled?

Yes	
No	

Do you attend hospital as a day patient?

Yes	
No	

If not employed (do not answer if working)

Do you think you are capable of some sort of employment?

Definitely yes	Would have difficulty	Definitely no

How often do you make attempts to find a new job?
(e.g. go to the Job Centre, look in the newspaper.)

Almost never	Rarely	Sometimes	Often

(Iffland et al., 2015; Morejon and Ga-Boveda, 2000). The heterogeneity of reliabilities in the subscales might be accounted for by the dissimilar structures of each subscales. Internal consistencies of the SFS as reflected by Cronbach's alpha values were good in Early Psychosis and SAD group, whereas ASD group showed poor internal consistency. All clinical groups showed moderate to high inter-correlations, suggesting that the SFS full scale and its subscales were strongly related.

Likewise, good concurrent validity of the SFS was reported for the Early Psychosis and SAD groups. The SFS full scale demonstrated significant moderate correlations with the WHODAS-2, as well as the SOFAS. Early Psychosis and SAD participants' subjective perception of their social functioning and disability (i.e., SFS and WHODAS-2) was consistent with the clinician administered assessment (i.e., SOFAS). Therefore, SFS seems to be a valid measure of social functioning in SAD patients. In contrast, the correlation between the SFS and SOFAS in the ASD group was only at trend levels and, while significant, the strength of association was weaker between the SFS and WHODAS-2.

Component analyses was then performed to evaluate the factor structure of the SFS on the whole sample and different disorders. The seven subscales were confirmed to measure a single construct, indicating that the subscales corroborated the total score in reflecting social functioning. Our finding was comparable with previous SFS studies in which one-factor solution was reported (Hellvin et al., 2010; Iffland et al., 2015; 50.4% in current study, 48.5% in the German version and 58.6% in the Norwegian version). The factor loadings were also found to be similar to previous studies (0.59–0.83 in current study, 0.62–0.77 in the German version and 0.65–0.81 in the Norwegian version). The subscale (5) Independence-Competence and (7) Employment have been consistently shown to have the lowest factor loadings. Factor analysis conducted in the English and Spanish version of the SFS also confirmed such a factor structure (Birchwood et al., 1990; Morejon and Ga-Boveda, 2000).

In line with the validations of the Norwegian (Hellvin et al., 2010) and German versions of the SFS (Iffland et al., 2015), a two-component solution was generated for the Early Psychosis, SAD and neurotypical group. Factors structures were similar between the SAD and neurotypical groups, with subscales (1) Withdrawal, (2) Interpersonal, and (3) Prosocial forming the "social engagement" factor and subscale (5) Independence-Competence, (6) Independence-Performance and (7) Employment/Occupation forming the "independence" factor. The only difference was the (4) recreation subscale which had a lower loading for both SAD (cross-loaded on both factors, 0.44 & 0.40) and neurotypical (0.48) groups, compared to Early Psychosis (0.70) and ASD (0.89) groups. Social withdrawal may more strongly link with long-standing recreational activities (hobbies; watching TV; art) in the Early Psychosis and ASD group where such activities may more consistently inflate social withdrawal.

The Early Psychosis group showed a different two-component factor structure compared to previous studies. For the (1) Withdrawal and (2) Interpersonal subscales, cross-loadings were observed for Early Psychosis patients, but not for Schizophrenia patients in the validation studies of the German and Norwegian version of SFS (Hellvin et al., 2010; Iffland et al., 2015). It is possible that social withdrawal and its associated effects on interpersonal relationships may not be as evident in Early Psychosis patients as those with Schizophrenia (Addington et al., 2003). The other five subscales, however, loaded well onto two factors, with (3) Prosocial, (4) Recreation, and (7) Employment forming the "social engagement" factor, and (5) Independence-Competence and (6) Independence-Performance forming the "independence" factor. Furthermore, the two factors explained 70% of variance in comparison to 55.5% and 55.7% in the German and Norwegian study (Hellvin et al., 2010; Iffland et al., 2015).

A three-component solution was found for the ASD group in our study. Factor one consisted of two subscales (1) Withdrawal and (2) Interpersonal, similar to the SAD and neurotypical group. Factor two consisted of (4) Recreation and (6) Independence-Performance, while factor three consisted of (5) Independence-Competence and (7) Employment/Occupation. Factor two suggests levels of non-work related activities that ASD individuals engage in, while factor three may represent the capacity to engage in structured, employment, training and related activities (e.g., working or therapy). Interestingly, in the ASD population, the capacity to live independently was not strongly associated with the actual performance of independent living. People with ASD may have already developed other methods for assisting or performing the daily activities that have emerged over the lifespan. Furthermore, factor two depicts daily activities that can either be performed alone or require minimal social interaction, in contrast to the socially-driven activities in factor one. This three-factor structure may reflectthe distinct social characteristics of ASD, in which social communication, the level of daily activities and the social capacity to engage in these activities are measured separately.

Sensitivity tests were performed using discriminant analyses. Overall, the SFS showed distinct classification between participants and clinical populations to suggest that the SFS is a sensitive instrument which can discriminate participants with social disorders from neurotypical control. When the analysis was repeated, discriminant analysis within clinical groups showed that the SFS could identify above 40% of participants in terms of their clinical diagnoses, however, the result did not reach statistical significance. Since the SFS is not a diagnostic assessment, the rates of identifying participants in their clinical groups may be considered acceptable (Iffland et al., 2015).

There were a number of limitations to this study. First, we did not include an objective measure of social disability. Such measures require development and would further assist concurrent validity assessments of self-reported scales. Second, the sample consisted largely of young adults with high education and relatively better occupational functioning compared with previous studies (Hellvin et al., 2010; Iffland et al., 2015). Participants were largely recruited from the inner-city of Sydney and future research including broader demographic representation is required. The results of this study also cannot be extrapolated to those with intellectual disability. Future research is required to understand the best measures of social functioning for this group. Third, we did not have large sample sizes for each clinical group. Traditionally, 5 participants per variable has been viewed as a minimum for factor analysis (Gorsuch, 1983; Tinsley and Kass, 1979), although debate exists and some have suggested greater numbers may be required (Osborne, 2014). Future studies could be conducted with larger numbers and different analytic approaches (e.g., parallel and MAP tests). Finally, this study did not examine the stability of the scale over time. Studies utilizing repeated measure designs can examine test-retest reliability in the future. To conclude, this study showed that the SFS is a reliable, valid and sensitive self-report instrument for use in participants diagnosed with Early Psychosis and SAD. This scale provides a useful measure for assessing one's level of functioning in these cohorts. Future studies are required to understand optimum methods for assessing social functioning in people diagnosed with ASD, with more research needed to identify behavioural measures of functioning and the use of significant other reports.

Conflict of interest

None.

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