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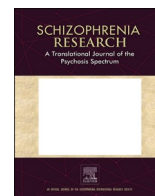
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A systematic review of social functioning outcome measures in schizophrenia with a focus on suitability for intervention research

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ABSTRACT

Social functioning is an important part of recovery and a key treatment target in clinical research in schizophrenia. Evaluating and comparing interventions is challenged by the choice of many measures which focus on different aspects of functioning, with little to guide selection. This results in difficulties comparing outcomes of treatment where studies have used different measures. To improve the measurement of social functioning in intervention research, we aimed to provide practical information on suitability of measures. We conducted a systematic review of measures developed or psychometrically evaluated since 2007, and assessed and discussed the structure, content, quality, and the use of the measures in intervention research. Thirty-two measures of social functioning and 22 validation papers were identified. Measures included structured questionnaires, semi-structured interviews, and assessment of performance on specific tasks. The content of measures was organised into eight categories, which are in order of frequency with which they were covered by measures: activities of daily living, productive activity, relationships, leisure activities, cognition, anti-social behaviour, psychosis symptoms and self-esteem and empowerment. In terms of quality, most measures were rated as moderate, with the Personal and Social Performance Scale gaining the highest rating. However, there was little data on responsiveness of measures, or how they compare to objective or 'real-world' indicators of functioning. The Social Functioning Scale and Personal and Social Performance Scale have been most frequently used in intervention studies to date. Future research should aim to provide further data on psychometric properties relevant to intervention research.

1. Background

Schizophrenia-spectrum disorders have some of the poorest outcomes across mental disorders (WHO, 2013), and deficits in social functioning are one of the main drivers of the global burden of the disorder (Insel, 2008). Social functioning is therefore a key target of interventions for people with these conditions (Leucht et al., 2012a,b). Despite its importance, there are established difficulties in defining social functioning (Priebe, 2007; Mausbach et al., 2009; Brissos et al., 2011; Peuskens and Gorwood, 2012), and little consensus on its constituent parts or approaches to measurement. Consequently, many different measures are used, resulting in difficulties in interpreting, comparing and combining the findings of treatment trials in systematic

reviews and meta-analyses (Prinsen et al., 2016). For example, a meta-analysis of clinical trials of antipsychotic medication was unable to draw conclusions about the impact on social functioning due to heterogeneity in measurement (Leucht et al., 2011), despite functioning being recognised as a necessary outcome criterion for treatment success (Juckel and Morosini, 2008).

The measurement of social functioning has evolved in line with other developments in the field. There is now consensus that cognition (Fett et al., 2011) and negative symptoms (Gonzales et al., 2013; Galderisi et al., 2014) are major determinants of social functioning, encouraging the development and evaluation of treatments targeting these deficits. Research suggests that the impact of these factors on social functioning may vary across domains of functioning (Harvey, 2013). Short-term

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memory and verbal learning may be more associated with employment outcomes (Bourdeu et al., 2012; Gonzales et al., 2013), whereas negative symptoms have been linked to social outcomes and relationships (Leifker et al., 2009). In contrast, positive symptoms are not necessarily related to functioning (Galderisi et al., 2018; Lin et al., 2013). Alongside this, virtual, computer-based methods have enabled less resource-intensive controlled measurement of the capacity to complete tasks relevant to real-world social functioning (Patterson and Mausbach, 2010; Harvey et al., 2007). These ‘performance-based measures’ capturing ‘functional capacity’ have evolved as intended replacements for, or adjuncts to traditional scales (Green et al., 2008).

Several previous reviews have investigated measurement of social functioning (Burns and Patrick, 2007, Mausbach et al., 2009, Brissos et al., 2011; Bjornestad et al., 2019). The most comprehensive of these concluded that many measures had not been validated in people with schizophrenia, there was scant information on key reliability and validity criteria relevant to interventional research, and many were too burdensome for administration in both research and clinical practice (Burns and Patrick, 2007). Authors identified the Global Assessment of Functioning (GAF) and its predecessor (Global Assessment Scale) as the most popular measures used in schizophrenia research. However, there are established problems with their structure as single-item clinician-rated measures in which symptoms are inextricable from the evaluation of functioning (Brissos et al., 2011), and evaluation of specific aspects of functioning are not possible (Burns and Patrick, 2007). Authors of the review recommended the use of The Personal and Social Performance Scale (Morosini et al., 2000) due to its performance on reliability and validity indicators in antipsychotic medication trials, but it had not been widely used at that time (Burns and Patrick, 2007). Another review focused on the inclusion of social media activity in social functioning measures and found only one measure that included it. Data on reliability and validity were scant across measures, and the increasingly popular performance-based measures were excluded from the review (Bjornestad et al., 2019). Previous reviews have also identified a lack of measures that capture motivation and desire to engage in activities (Mausbach et al., 2009).

There has been a significant increase in the diversity of approaches to the measurement of social functioning in recent years, and researchers conducting research on the efficacy of interventions for schizophrenia require information on their content, quality and the practicalities of using them in this population. The current review aims to identify all measures of social functioning developed or psychometrically validated in people with schizophrenia and related disorders since 2007. The review aims to assess the methods of administration, content, quality (reliability and validity) and use of individual measures, specifically

focusing on features relevant to the use of such measures in research on treatments or interventions.

2. Methods

2.1. Design

Preferred Reporting Items for Systematic Reviews and meta-analyses (PRISMA) guidelines (Moher et al., 2009) were followed. The protocol was registered online on the PROSPERO on 07/03/2018 (CRD42018090418).

2.2. Search strategy

Firstly, a scoping review of the literature was undertaken to ensure that search terms were exhaustive. Following this, Ovid and EBSCO were used to search the following databases from December 2006 to August 2021: CINAHL, PsychINFO, MEDLINE, Embase, Social Policy and Practice, AMED, Health and Psychosocial Instruments. Search terms included variants of social functi*, schiz* or psychos?s and measure, framework, concept (full search terms included in Fig. 1). Where possible MeSH headings (or equivalent) were used in each database to ensure all papers were identified which were indexed under schizophrenia-spectrum disorders. Additional hand searches were conducted of contents pages of major journals and systematic reviews. Forward citation searches were conducted in PubMed and ScienceDirect to determine the frequency of use in intervention research in schizophrenia, and this was also used to identify papers reporting further psychometric evaluation and adaptation.

Papers were eligible if they were peer-reviewed and published in English, and reported the development or psychometric evaluation of a measure of social functioning in people with schizophrenia or related disorders. Papers reporting further psychometric evaluation of older measures of social functioning in this population were included if they featured in the last comprehensive review of measures at the time the current review was designed (Burns and Patrick, 2007), suggesting their ongoing popularity. Measures that used mixed diagnostic samples were included if the data for those with schizophrenia were presented separately and comprised over 50% of the sample. Studies were excluded if they reported the development of a measure of social functioning that attempted to capture a single element of functioning (i.e. employment), a measure of ‘recovery’, or a measure that was validated solely in ‘at-risk’ for psychosis populations.

(“social funct*” OR “patient funct**” OR “personal funct*” OR “community funct*”
OR “functional status” OR “community participation” OR “social network” OR
“social life” OR “social adjustment” OR “social adaptation” OR “social integration”
OR “social disability” OR “perceived social disability” OR “social dysfunct*”) AND
 (“schizophreni*” OR “psychotic” OR “psychosis”) AND (“psychometric evaluat*” OR
“psychometric properties” OR “outcome” OR “measure” OR “quiz” OR “instrument”
OR “questionnaire” OR “analysis” OR “scale” OR “validity” OR “reliability” OR
“responsiveness” OR “sensitivity” OR “concept*” OR “rationale” OR “theory” OR
“model” OR “design” OR “develop*” OR “paradigm” OR “framework” OR
“dimension” OR “defin*”)

Fig. 1. Key words for electronic database searches, which were used to identify database-specific MeSH subheadings and thesaurus terms to ensure all concepts are covered.

2.3. Data collection, data extraction and synthesis

All papers identified were exported into Mendeley referencing software v1.9.4 and duplicates were removed. Titles and abstracts of citations were screened for eligibility by ML. A 10% sample was independently assessed for eligibility by a second reviewer (JS). For those identified as relevant, or in ambiguous cases, the full text was sought and independently screened for eligibility by two researchers (ML and JS) who discussed any issues until a consensus was reached. In four cases a final agreement was sought from a third researcher (JM).

A data extraction database was developed and piloted independently by two researchers (ML and JS). The data were extracted in four stages. The first related to the type of study and measure, date of publication, country, participant characteristics, intended use, and details on method of administration, domains or areas of functioning covered, scoring, and development. The second related to validity and reliability properties which are discussed below. The third involved sourcing the full measure from each paper in order to categorise item content, and authors were contacted if full measures were not available. The fourth involved exporting forward citation searches and checking for intervention research that had used the identified measures.

For administration, we describe the method of administration, the where reported, duration of administration and training requirements. For content, we categorised the many aspects of functioning covered in the different measures into broad categories in order to present an overview. Categories were constructed by reviewing descriptions of the

content of different measures and the items themselves, and they were refined through discussion and consensus among the research team.

2.4. Quality assessment

Identified measures were assessed using a quality assessment for good measurement properties in health questionnaires by Terwee et al. (2007). Two authors undertook the quality assessment independently (ML and JS) and held consensus meetings to discuss discrepancies. Each criterion was scored between 0 and 2. Individual scores were then combined to assess the overall quality of the measure. Quality labels were assigned to total scores (0–4: ‘poor’, 5–9: ‘moderate’, 10–14: ‘good’, 15–18: ‘very good’), as implemented in other reviews of outcome measures (Stansfeld et al., 2017; Stoner et al., 2015).

3. Results

The search yielded 19,410 records after deduplication. 193 papers were subject to full-text screening (see PRISMA diagram in Fig. 2). Fifty-four papers reporting the development, psychometric evaluation, or validation of 32 measures of social functioning were included. The measures were developed in the USA, Canada or Europe, except for seven (21%) which originated from Australia, China, Hong Kong and Israel. Table 1 describes the key characteristics of the identified measures, including information on administration, scoring and the content of each measure.

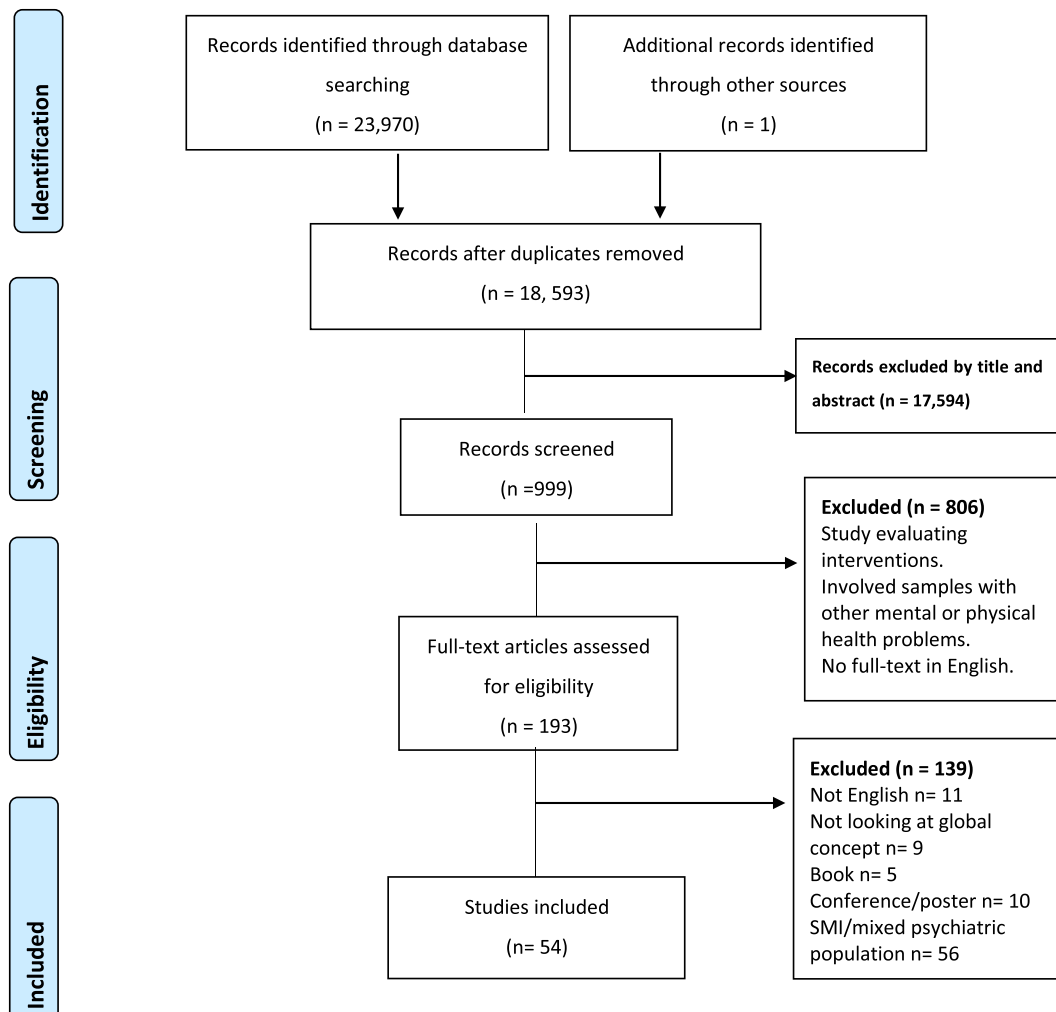


Fig. 2. PRISMA diagram.

Table 1
Characteristics of identified measures organised by year of publication.

Social functioning measures						
Name of outcome measure and author	Year	Country	Administration	Scoring	Content	Time to administer
Self-rated Personal and Social Performance scale (SRFS) Zhao et al., 2019	2019	China	Self-report structured questionnaire with 3-point Likert scales	Global score (0–24) derived from twelve questions across four PSP domains, with a higher score indicating better functioning. Questions 3–9 are rated from 0 to 2, 0 - no/bad, 1- sometimes/plain, and 2- yes/good. Questions 1, 2 and 10–12 are also rated from 0 to 2, but are reverse scored, 0 -yes/good, 1- sometimes/plain, and 2- no/bad.	Socially useful activities Personal and social relationships Self-care Disturbing and aggressive behaviour	NR
Four item version of the Functional Remission of General Schizophrenia scale (Mini FROGS) ^a Mallet et al., 2018	2018	France	Self-report structured questionnaire with 5-point Likert scales	Global score (4–20), with higher scores indicating better functioning derived from four items each scored from 1 to 5 (1- do not do; 2- do partially; 3- do a significant part; 4- do almost all the activity; 5- do perfectly).	Travel and communication Management of illness and treatment Self-esteem and sense of independence Respect of biological rhythms	NR
Health of the Nation Outcomes (HoNoS) Smith et al., 2017	2017	UK	Observer-rated structured questionnaire with 5-point Likert scales	Global score (0–48), with higher scores indicating worse functioning, derived from twelve items each scored from 0 to 4, concerned with past 2 weeks (0- no problems, 1- minor, 2- mild, 3- marked, 4- serious/severe, incapacitating).	Behaviour Impairment Symptoms Social Functioning	NR
The Daily Activity Report (DAR) Velligan et al., 2016	2016	USA	Observer-rated based on semi-structured interview via phone call 3 times per day for 7 consecutive days, which interviewer uses to rate the respondent's activity levels in the last 24 h on 4-point Likert scales.	Global score of average level of activity per hour, per week across 3 domains, 1–3 excluding sleep, or 0–3 including it. Each hour of the day is assigned a score per domain with regard to the level of activity achieved from 0 to 3 (0- asleep or not engaged to 3-engaged in activity relevant to domain). A further score per domain is assigned for the initiation or independence of activity. Higher scores indicate greater independence and self-initiation in daily activities.	Instrumental activities Work or school Social	NR
Assessment of Lifespan Functioning Attainment (ALFA) scale ^b Joseph et al., 2015	2015	USA	Self-report, interviewer administered structured questionnaire comprised of table of adult years broken down into epochs	Global score 0–100 comprised of percentage of adult years spent engaged in activity across 5 domains.	Paid employment (including full time child care or student status) Living independence Maintenance of close friendships Attainment of romantic relationships Engagement in recreational activities with non-family members	NR
Mini-ICF-APP ^d Pinna et al., 2015	2015	Germany	Clinician or observer-rated 6-point Likert scales	Each domain scored from 0 (no impairment) to 5 (total disability)	Adherence to regulations Planning and structuring of tasks Flexibility Competency Endurance Assertiveness Contact with others Group integration Intimate relationships Non-work activities Self-care Mobility Confidence to judge and decide	NR
Time Use Survey Hodgekins et al., 2015	2015	UK	Self-report interviewer-administered semi-structured interview which prioritises participant recall, but diaries, calendars, mobile phone data or	Global score of hours per week spent in structured activity across 7 domains derived from structured activity levels over the past month.	Employment Education and training Voluntary work and informal caregiving Leisure activities and sports	20 min

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Table 1 (continued)

Social functioning measures						
Name of outcome measure and author	Year	Country	Administration	Scoring	Content	Time to administer
First Episode Social Functioning scale (FESFS) ^c Lecomte et al., 2014	2014	Canada	Self-report structured questionnaire with 4-point Likert scales	Global score comprised of sum of two dimensions across 8 domains in past 3 months. Each is evaluated per domain on a four point Likert scale of the two dimensions of perceived ability (1 – totally disagree to 4-totally agree), and frequency of behaviours (1-never to 4-always).	Socialising Childcare Housework and chores Friends and activities Independent living skills Interacting with people Intimacy Family Relationships and social activities at work Work abilities School relationships and activities Educational abilities	NR
Grid for Measurement of Activity and Participation (G-MAP) ^d Belio et al., 2013	2013	France	Observer-rated based on semi-structured interview alongside structured questions including 3, 4 and 5-point Likert scales	Six domains which each include 3–6 items which are each given a score for activity limitation between 0 (an absence of limitation) to 2 (total limitation), and participation restriction between 0 (an absence of restriction) and 3 (total restriction). Scores are also given for environmental factors including social support availability scored from 0 (no support) to 3 (3 categories of support mentioned), social support satisfaction from 0 (dissatisfied) to 4 (very satisfied), attitudes from 1 (facilitator) to 4 (neither barrier nor facilitator), systems and policies from 1 (facilitator) to 4 (neither barrier nor facilitator)	Dimensions: Activity limitation Participation restriction Domains: Personal care Domestic life Interpersonal relationships and interactions Economic and social productivity Leisure Community and civic life	Up to 4 h
Life Functioning Assessment Inventory (L-FAI) ^e Hui et al., 2013	2013	Hong Kong	Observed-rated based on semi-structured interview which interviewer uses to rate the participant on 5-point Likert scales	Global score not recommended. Each domain is awarded two scores, one for functioning status from 1 (very low function) to 5 (very high function) and depending on which score is selected, interviews then decide on the ‘grade’ corresponding to that score (1–10) depending on other factors such as complexity of activity.	Work Social relationships Leisure Home making	20 min and extensive training required to learn how to administer (1–2 days).
International Classification of Functioning self-assessment Haglund and Fältman, 2012	2012	Sweden	Self-report structured questionnaire with 5-point Likert scales	Global mean score across domains, and each domain is scored for ability to complete related activities from 0 (no difficulty) to 4 (extreme difficulty), and level of satisfaction 0 (very great satisfaction and enjoyment) to 4 (great dissatisfaction and displeasure)	Learning and applying knowledge General tasks and demands Communication Mobility Self-care Domestic life Interpersonal interactions and relationships Major life areas Community, social and civic life	1–2 h
Psychosocial remission in schizophrenia scale (PSRS) ^e Barak et al., 2010	2010	Israel	Observer-rated based on semi-structured interview used by interviewer to complete 7-point Likert scales	Global score (7–56) derived from sum of scores across two domains from each item which are scored from 1 (no impairment) to 7 (extreme impairment).	Quality of life IADLs Divided into two dimensions: symptomatic remission and psycho-social remission	10–15 min
Functioning Assessment Short Test (FAST) Gonzales-Ortega et al., 2010	2010	Spain	Observer-rated 4-point Likert scales based on semi-structured interview	Global score (0–72) based on items each scored from 0 (no difficulty) to 3 (severe difficulty) across domains based on behaviours and abilities in past 15 days.	Autonomy Occupational functioning Cognitive functioning Financial issues Interpersonal relationships Leisure time	NR
Schizophrenia Outcomes Functioning Interview (SOFI) ^{f,h} Kleinman et al., 2009	2009	USA	Observer-rated based on semi-structured interview with Interviewer judgement using anchor points.	Global score (1–100) derived from average of scores from each domain. Each domain scored from 1 (poor functioning) to 100 (excellent functioning), with	Living situation (stability, structure, supervision vs independence) IADLs (financial and medication management,	30–45 min.

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Table 1 (continued)

Social functioning measures						
Name of outcome measure and author	Year	Country	Administration	Scoring	Content	Time to administer
				anchors provided for each 10-point interval.	transport, housework/childcare, self-care, shopping, food/cooking, planning leisure activities)	
Functional Remission of General Schizophrenia (FROGS) scale Llorca et al., 2009	2009	France	Self-report and semi-structured interview used to complete structured questionnaire with 5-point Likert scales	Global score (19–95) derived from 19 items related to functioning behaviours and abilities over the past month across the domains each scored from 1 to 5 (1- do not do; 2- do partially; 3- do a significant part; 4- do almost all the activity; 5- do perfectly). Higher scores indicate higher functioning.	Productive activities (work, other vocational oriented activities, treatment related activities, education, homemaking/childcare) Social functioning (social activity, social support) Daily life Social activities Social functioning Quality of rehabilitation General health and treatment	NR
Social Integration Survey (SIS) ^g Kawata and Revicki, 2008a	2008	USA	NR	Global score and individual domain scores can be used, each transformed onto 0–100 scale. Scores derived from 62 items, each scored from 0 to 4 based on activity or behaviour over the past 4 weeks. No further information available on scoring given by authors.	Social perception Work interactions Social skills Social cognition IADLs/self-care	15–20 min
Objective Social Outcomes Index (SIX) Priebe et al., 2008	2008	UK	Self-report or collected from medical records	Global index (0 to 6) derived from scores six items: employment (none, 0; voluntary/protected/sheltered work, 1; regular employment, 2), accommodation (homeless or 24 h supervised, 0; sheltered or supported accommodation, 1; independent accommodation, 2), partnership/family (living alone, 0, living with a partner or family, 1) and friendship (not meeting a friend within the last week, 0; meeting at least one friend in the last week, 1).	Work Housing Social life	A few minutes
Socially-valued Role Classification Scale (SRCS) Waghorn et al., 2007	2007	Australia	Observer-rated based on semi-structured interview used alongside anchor descriptions.	Global score or score per role. Specific scoring instructions not reported.	Self-care and home duties Caring for others Self-development, voluntary work or rehabilitation Formal education or training Employment	90 min
Mental Illness Research Education and Clinical centre version of the Global Assessment of Functioning scale (MIRECC GAF) Niv et al., 2007	2007	USA	Clinician or observer-rated based on knowledge of patient or questioning.	Sub-scale (domain) specific scores only. Each sub-scale is given a score between 1 and 100, with lower scores indicating more impairment. Each domain is divided into ten equal intervals with anchor rating included for scoring within each interval.	Occupational functioning Social functioning Symptomatic functioning	NR
Patient Perceptions of Functioning Scale (PPFS) Ehmann et al., 2007	2007	Canada	Self-report structured questionnaire with 5-point Likert scales	Global score (5–25) derived from 6 items related to abilities across the two domains scored from 1 (very poor) to 5 (very good).	Community functioning Cognition	NR
WHO Disability Schedule 2.0 (WHO DAS II) ^d Chopra et al., 2004	2004	Australia	Self-report with structured questionnaire based on 5-point Likert scales based on past 30 days	Global score or per domain comprised of 32 items with responses rating the level of difficulty in different activities from 0 (none) to 4 (extreme)	Understanding and communicating Getting around Self-care Getting along with people Life activities Participation in society	NR
Personal and Social Performance Scale (PSP) Chiu et al., 2018; Nasrallah et al., 2008; Kawata and Revicki,	2000	Italy	Clinician judgement used to rate 6-point Likert scales	Single-item rating scale (1–100), sub-divided into 10 equal intervals with higher scores indicating better functioning and fewer difficulties over the past month. Difficulties across the domains are given a	Socially useful activities Personal and social relationships Self-care Disturbing and aggressive behaviours	Less than 5 min

(continued on next page)

Table 1 (continued)

Social functioning measures						
Name of outcome measure and author	Year	Country	Administration	Scoring	Content	Time to administer
2008b; Morosini et al., 2000				score between 1 (absent) and 6 (very severe) and scores are adjusted within intervals using additional information around physical health and living skills.		
Social Functioning Scale (SFS) Chan et al., 2019; Birchwood et al., 1990	1990	UK	Self-report with structured questionnaire including 4 and 5-point Likert scales based on the past three months	Global score or per domain comprised of 78 items yielding a raw score which is transformed to a distribution with mean of 100 and SD of 15	Social engagement/ withdrawal Interpersonal behaviour Pro-social activities Recreation Independence- competence Independence- performance Employment/occupation	NR
Interview Schedule for Social Interaction (ISSI) ^b Henderson et al., 1980; Eklund et al., 2009	1980	Australia	Self-report with 2,3, 4 and 5-point Likert scales covering relationships in the past 12 months	Global score (0–30) derived from addition of scores per domain, calculated across the 52 items.	Availability of attachment Perceived adequacy of attachment The availability of social integration The adequacy of social integration	45 min
Social Behaviour Schedule (SBS) ^j Cella et al., 2014; Wykes and Sturt, 1986	1986	UK	Clinician or observer rated 5-point Likert scales based on interview with patient or relative or observation based on previous month	Global score based on 21 items 5-point anchored scale from 0 (no problem or acceptable behaviour) to 4 (serious problem), with a higher score representing lower levels of functioning.	Antisocial behaviour Depressed behaviour Social withdrawal Thought disturbance	15 min
Task-based measures of social functioning						
Name of outcome measure and author	Year	Country	Administration	Scoring	Domains	Time to administer
Computerised battery functional tasks (CBFT) ^l Czaja et al., 2017	2017	USA	Computerised role play, with video text and speech instructions, interviewer facilitated	Individual scores given for each task. Score for the ATM and Prescription Refill tasks include a rate measure (total correct/time), which reflect a measure of task efficiency and a ratio measure (total correct score achieved/total correct score possible), which reflects a measure of accuracy. Task completion time is included for each of these tasks. Score for the forms completion is the time it takes to complete all demographic data in the form.	ATM banking/money management task Prescriptions refill via telephone/voice menu system task Forms completion (a clinic and patient history form) task	Not reported
Virtual Reality Functional Capacity Assessment Tool (VRFCAT) Ruse et al., 2014	2014	USA	Computerised 'virtual reality' role-play	Global score derived from raw scores from performance on 12 different tasks across 5 domains. A composite of time to completion (mins and secs) and accuracy of performance (percentage).	Transportation tasks Finances tasks Household management tasks Planning tasks	Not reported
Matrices Functional Assessment Battery (MFAB) ^k Velligan et al., 2014	2014	USA	Computerised role play tasks	Global score or score for individual task/domain. Each task/domain is calculated as percent correct, or is transformed to yield a score ranging from 0 to 100. Overall score calculated as mean of all tasks/domains. Higher scores indicate better functioning.	Comprehension and household management (UPSA) task Work and productivity (TABS) task	Not reported
Beijing Performance-based Functional Ecological Test (BJ-Perfect) ^l Shi et al., 2013	2013	China	In-person role play tasks with interviewer	Global score derived from domain raw scores which are converted to standardised 0–100. Each domain has a possible score range of 0–11 (transportation and financial management) and 0–17 (work ability).	Transportation task Financial management task Work ability task	25–30 min.
Canadian Objective Assessment of Life Skills (COALS): a measure of functional competence ^m McDermid Vaz et al., 2013	2012	Canada	In-person role play tasks with interviewer	Global score or divided into two dimensions of tasks. Higher score for completing tasks accurately and problem-solving posed challenges.	Health and hygiene task Time management task Transportation task Crisis management task Domestic activities task	25 min
University of California, San Francisco Performance-based Skills Assessment (UPSA brief) ⁿ Mausbach et al., 2007 adapted from Patterson et al., 2001	2007	USA	In-person role-play with interviewer administered with props	Global score 0–100 derived from sub-tasks in each domain that yield scores 0–9 (finance) and 0–6 (communication) with higher scores representing higher levels of accuracy.	Finance task Communication task	10–15 min
	2007	USA	In-person role play tasks with interviewer	Global score (0–100) derived from a mean of the percentage correct for each domain/task.	Medication management skills task	40 min

(continued on next page)

Table 1 (continued)

Task-based measures of social functioning						
Name of outcome measure and author	Year	Country	Administration	Scoring	Domains	Time to administer
Test of Adaptive Behaviour in Schizophrenia (TABS) ^o Velligan et al., 2007					'Empty bathroom' task Shopping skills task 'Clothes closet' task Work and productivity task Social skills task	

^a Adapted from FROGS.

^b Focuses on functioning across the lifespan.

^c Developed for a first episode psychosis population.

^d Informed by the International Classification of Functioning (ICF) framework.

^e Developed to complement assessment of symptomatic remission by the PANSS.

^f Designed for use in clinical trials evaluating interventions targeting cognitive impairment.

^g Patient and informant versions available.

^h Based on a theory of attachment.

ⁱ Designed to detect small changes in social behaviour and therefore may be sensitive to more chronic patients.

^j Available in English and Spanish versions.

^k Experts selected sub-scales from UPSA and TABS that they considered to be most appropriate across different cultural contexts.

^l Designed for use by patients in China.

^m Measure targets 'procedural knowledge routines' and 'executive operations' that authors argue underlie independent living in the community.

ⁿ Adapted from UPSA measure using factor analysis to determine which sub-scales explained most of the variance in symptomatic remission.

^o Measure is sensitive to the initiation of action and the ability to identify problems.

3.1. Methods of administration

Ten measures consist of structured questionnaires where the respondent is asked to comment on their abilities and frequency of behaviours or activities. Eleven consist of semi-structured interviews which are then used as the basis for researchers or clinicians to rate various aspects of functioning. Two measures use a combination of these methods. A further two measures aim to capture patterns of daily activity. The Daily Activity Report (DAR) involves researchers gathering data three times a day for seven days by telephoning participants. The Time Use Survey (TUS) uses patient recall, sometimes supplemented by diary records, mobile phone data and information from informants as the basis for calculating time spent in structured activity over the past month. Seven measures are 'performance-based,' assessing performance on specific tasks under test conditions (see Table 1). These measures utilise in-person role play, or basic computerised tasks to capture functional capacity. The Virtual Reality Functional Capacity (VFCAT) uses computerised virtual reality scenarios. These measures are designed to test abilities such as planning, problem-solving and communication ability.

Although it is only reported for 16 measures, time to administer is between a few minutes (Objective social outcomes index, SIX) and up to 4 h (Grid for Measurements of Activity and Participation, G-MAP), with most in the range of 15–40 min. Only one measure reported training requirements (Life Functioning Assessment Inventory, L-FAI), with significant time needed for training, at 1–2 days. The SIX, which aims to capture objective social outcomes, has been validated to be completed using medical records or an informant, and informant versions of the Schizophrenia Outcomes Functioning Interview (SOFI), WHO DAS II and Social Integration Survey (SIS) have also been validated. The Daily Activity Report (DAR) requires a researcher to call respondents 3 times per day for 7 consecutive days, which may be impractical for large, multi-site clinical trials. The TUS consists of calculation of time spent in structured activity across domains over the past month. The measure prioritises respondent recall, which raises questions about its validity in some contexts, though informant data including close others, diaries, calendars and mobile phone data can be used.

3.2. Content

Since aspects of social functioning included in the measures ranged

over many areas (see details in Table 1), the content of measures was grouped into eight categories as shown in Table 2. Items, tasks or other content relating to the activities of daily living category (including health management) feature most commonly, being represented in 28 measures (84%), followed by the category of productive activity (work, voluntary work and education) in 22 measures (66%); relationships in 20 measures (63%); leisure activities in 14 measures (44%), social and non-social cognition in eight measures (25%); anti-social behaviour in six measures (19%), symptoms of psychosis and self-esteem and empowerment both represented in three measures (9%). Categories represented in performance-based measures only covered activities of daily living (7/7, 100%) and productive activity (3/7, 43%). The Functional Remission of General Schizophrenia scale (FROGS), Health of the Nation Outcomes (HoNOS) and SIS cover the most areas of social functioning.

Productive activity items award the highest scores for those who have paid jobs, high performance and do not require assistance (SOFI, The SIX). Seven measures (44%) include items that score participation in sheltered or voluntary employment (DAR, G-MAP, SOFI, SIS, the SIX, SRCS, MIRECC GAF). Among the performance-based measures, some tasks aim to capture aspects of work performance, including the 'work and productivity' task shared by both the TABS and MFAB, and the 'work ability' task in the BJ-Perfect.

Twenty measures (63%) include content capturing information about relationships. The Interview Schedule of Social Interaction (ISSI), Assessment of Lifespan Functioning Attainment (ALFA) and the First Episode Social Functioning Scale (FEFS) have a predominant focus on relationships, with the latter including items about online interactions, an area likely to be important to young people and during the COVID-19 pandemic. Six (19%) measures include items on sexual intimacy (GMAP, WHO DAS II, FAST, ICF, FESFS, FROGS). Performance-based measures do not include items related to relationships. Fourteen measures (44%) include items related to leisure activities. Nine measures (28%) include items related to cognition and social cognition. This includes items related to concentration and conversation ability (PPFS, WHO DAS II, SFS, Mini ICF APP), learning and applying knowledge (ICF self-assessment), planning tasks (Mini-ICF-APP, VRFCAT) and social perception (SIS). Six measures (19%) include items concerning antisocial behaviour, such as aggression (PSP, SRFS, HoNoS), violence (SBS, FROGS), socially unacceptable habits or manners (SBS), rudeness and anger (SIS).

Table 2
Domain content.

	ADLs	Productive activity	Relationships	Leisure activity	Cognition	Anti-social behaviour	Psychosis symptoms	Self-esteem and empowerment
FROGS	X	X	X	X	X	X		X
HoNoS	X	X	X		X	X	X	
SIS	X	X	X	X		X		X
FAST	X	X	X	X	X			
ICF	X	X	X	X	X			
WHO DAS II	X	X	X	X	X			
FESFS	X	X	X	X				
G-MAP	X	X	X	X				
Mini-ICF-APP	X		X	X	X			
Time use	X	X	X	X				
L-FAI	X	X	X	X				
ALFA	X	X	X	X				
PSP	X	X	X			X		
SOFI	X	X	X	X				
SFS	X	X	X	X				
SRFS	X	X	X			X		
MIRECC GAF		X	X				X	
DAR	X	X		X				
SRCS	X	X						
PPFS	X				X			
PSRS	X		X					
Mini-FROGS	X							X
SIX		X	X					
BJ-Perfect	X	X						
VRFCAT	X				X			
TABS	X	X						
MFAB	X	X						
SBS						X	X	
UPSA brief	X							
CBFT	X							
COALS	X							
ISSI			X					

Measures were included in the category of social and non-social cognition if they included items related to any of the seven key cognitive domains assessed in schizophrenia (working memory, attention/vigilance, verbal learning and memory, visual learning and memory, reasoning and problem solving, speed of processing and social cognition) outlined by the MATRICS consensus (Green et al., 2004).

Thirty-one (97%) measures identified have sub-scales, dimensions or domains that can standalone, many of which have been determined by factor analysis. This is helpful for intervention research exploring different aspects of social functioning. Total global scores can also be calculated for 31 measures (97%) with the exception of the MIRECC GAF, which is only calculated per sub-scale and consists of occupational, social and symptom subscales, improving upon the GAF.

3.3. Population

Seven (22%) measures have been developed with specific population criteria or contexts in mind. The FEFS and L-FAI were designed specifically for a first episode population, the former including items related to the internet and social media. The Mini-FROGS was developed specifically for people in remission, and the ALFA is the only measure to attempt to evaluate functioning at different stages across the lifespan. The SBS was designed for people with chronic conditions. The MATRICS Functional Assessment Battery (MFAB) has been designed to be culturally adaptable across the global north and south.

3.4. Quality assessment

Table 3 presents ratings of quality indicators. Overall, no measure scored in the ‘very good’ category, two scored in the ‘good’ category (PSP and DAR), and most were considered ‘moderate’ or ‘poor’. The best performing measure across all the indicators of quality is the Personal and Social Performance Scale (11/18, PSP, Morosini et al., 2000) which scores highly on some aspects of validity and reliability. However, measures do not differentiate much on overall scores, and 19 scored in the ‘moderate’ range. Moreover, when used in a large pan-European multi-site trial identified in the searches for the use of measures, the

PSP had low reproducibility (agreement) when used by non-clinician researchers (White et al., 2016).

Eight (25%) of 32 measures obtained the highest score on the content validity criterion due to lack of consultation with people with lived experience of schizophrenia, and experts or investigators about item selection, considered essential in patient reported outcomes (De Vet et al., 2011). Nine (28%) measures obtained the highest score on construct validity, as associations with other measures of social functioning found reasonable correlations. No measures scored the highest score on criterion validity, which reflects the lack of any agreed gold standard of social functioning evaluation. Tests to determine the presence of floor and ceiling effects were conducted for six measures (19%). The highest score which indicates that the true extent of respondents’ abilities may be captured was only achieved by three measures (L-FAI, SFS, The SIX).

In terms of reliability, four measures (13%) were awarded the highest scores for inter-rater reliability (reproducibility, agreement), the L-FAI, SBS, FAST and SIS. Ten measures (31%) were awarded the highest score on test-re-test reliability (reproducibility, reliability). Four measures (13%) scored highest for internal consistency (FROGS, self-rated PSP, DAR, and SIS). Authors of several measures argued that internal consistency was not applicable because the measure was based on a formative structural model, which does not require separate domains to be statistically correlated (SIX, SOFI, GMAP). Only one measure (PSP) obtained the highest ratings for responsiveness, as it was able to detect clinically meaningful change over time as judged by comparison with the Clinical Global Improvement (CGI) scale and the Positive and Negative Syndrome Scale (PANSS), (Nasrallah et al., 2008).

Interpretability captures the ability of measures to make distinctions within and between populations that are meaningful in the real-world, to predict objective aspects of functioning and whether criteria for

Table 3
Quality assessment.

Measure	Content validity	Internal consistency	Criterion validity	Construct validity	Reproducibility - agreement	Reproducibility - reliability	Responsiveness	Floor/ceiling effects	Interpretability	Total
PSP	1	2	0	2	0	2	2	1	1	11/18 G
DAR	2	2	0	2	1	2	0	0	1	10/18 G
SIS	2	2	0	2	2	1	0	0	0	9/18 M
SBS	1	2	1	2	2	1	0	0	0	9/18 M
L-FAI	1	0	0	2	2	2	0	2	0	9/18 M
SOFI	2	0	1	2	0	1	0	0	1	9/18 M
FAST	1	2	1	1	2	2	0	0	0	9/18 M
VFCAT	2	0	0*	1	0	2	0	2	1	8/18 M
UPSA	1	2	1	1	0	1	1	0	1	8/18 M
brief SFS	1	2	0	1	1	0	0	2	1	8/18 M
Mini FROGS	1	1	2	1	0	0	1	0	1	7/18 M
SRCS	1	0	1	1	0	2	2	0	0	7/18 M
FROGS	1	2	0*	2	0	0	1	0	1	7/18 M
FESFS	1	1	0*	2	0	0	1	1	0	6/18 M
COALS	1	0	1	1	0	2	0	0	1	6/18 M
Mini-ICF-APP	1	0	0*	2	0	2	0	0	1	6/18 M
G-MAP	2	n/a	0	0	0	0	0	0	1	5/18 M
BJ-Perfect	1	1	0*	0	1	2	0	0	0	5/18 M
The SIX	2	n/a	0	1	0	0	0*	2	0*	5/18 M
MIRECC	0	0	1	1	0	2	0	0	1	5/18 M
GAF	1	2	1	0	0	0	0	0	1	5/18 M
ISSI	1	2	1	0	0	0	0	0	1	5/18 M
SRFS	1	2	0	1	0	0	0	0	1	5/18 M
PPFS	1	0	1	1	0	1	0	0	0	4/18 P
PSRS	1	0	0	0	0	2	0	0	0	3/18 P
ALFA	1	0	0	1	0	0	0	0	1	3/18 P
Time Use	1	0	0	0	0	0	0	0	2	3/18 P
ICF	2	0	0	0	0	0	0	0	0	2/18 P
CBFT	1	0	0	0	1	0	0	0	0	2/18 P
ICF	2	0	0	0	0	0	0	0	0	2/18 P
MFAB	1	0*	0*	1	0	0*	0	0	0	2/18 P
TABS	1	0	0	1	0	0	0	0	0	2/18 P
WHO DAS II	1	0	0	0	0	0*	0	0	0	1/18 P
HoNoS	1	0	0	0	0	0	0	0	0	1/18 P

A score of 2 was awarded for a study that was well-designed and reported good performance; a 1 was awarded if performance was good but there were methodological flaws in the study design, methods or if this information was not well reported; a 0 was awarded if no information was found on the criterion, and 0* was awarded if the study produced poor results despite good methods. Scores 0–4 were assigned a label of ‘poor’, 5–9 a label of ‘moderate’, 10–14 were assigned a label of ‘good’ and 15–18 were assigned a label of ‘very good’. In cases where multiple studies reported validation and psychometric evaluation of the same measure, these were integrated in the quality assessment scores.

minimum important change have been established. Only one measure established minimally important change. The PSP validation study employed different methods, including anchoring to CGI scale scores, a method that has been applied to other scales (Leucht et al., 2013; Leucht et al., 2005). All methods converged on a minimally important change of around 7 points (Nasrallah et al., 2008), a finding echoed in another validation study (Patrick et al., 2009). Thirteen other measures looked at distinctions between different groups. Research on the Time Use survey suggested distinct cut-off points for time in structured activity for healthy volunteers, people with a first episode of psychosis, people ‘at risk’ of psychosis and those with long-term conditions using Receiver Operating Characteristic (ROC) curves. The VRFCAT, Social Functioning Scale (SFS), Canadian Objective Assessment of Life Skills (COALS), Mini-ICF APP and DAR were also able to differentiate between people with schizophrenia and healthy volunteers. The UPSA-B demonstrated strong positive predictive value (PPV) for residential independence (PPV = 78.8%), but low PPV for employment (PPV = 35.7%) (Mausbach et al., 2011). The PSP was shown to differentiate between different levels of severity as measured by the CGI (Nasrallah et al., 2008) and overall score was found to correlate with independent living situation (Patrick et al., 2009). The FROGS, mini-FROGS, SOFI and Mini ICF APP were able to differentiate between remitted and non-remitted patients, with remission defined using various instruments including the PANSS.

Forward citation searches revealed two further studies exploring the association between measures and real-life indicators of social functioning, which were not within the scope of the quality assessment. An experience sampling methods study (ESM, Larson and Csikszentmihalyi, 1983) on the SFS found that the interpersonal and activity domains correlate with time spent in relevant activities (Schneider et al., 2017). In contrast, an ESM study found that the UPSA-b does not correlate with what patients do in real life (Granhölm et al., 2020).

3.5. Use of measures in intervention research

Table 4 shows results of forward citation searches which revealed that 17 of the measures identified have been used in intervention studies in populations with schizophrenia since 1990. The most commonly used measures are the PSP and the SFS, and have been used on average six and four times per year since development. They have been validated in a number of different languages, cultures and populations including in First Episode Psychosis (FEP) (see Table 1). The PSP has been used as primary outcome in five studies, three of which are randomised-controlled trials of psychosocial interventions and two drug trials (see Appendix 1). The SFS has been used as a primary outcome in 12 studies, including a number of drug trials and trials of psychosocial interventions (see Appendix 1).

The most commonly used performance-based measure is the UPSA-brief (UPSA-b, Mausbach et al., 2007), which is an abbreviated version of the UCSD Performance-Based Skills Assessment (UPSA, Patterson et al., 2001; Patterson and Mausbach, 2010) and has been validated in a number of languages and cultures (see Table 1), and can be administered via a mobile-app. It has been used as a primary outcome in four studies, including a drug trial and trials of interventions aimed at enhancing cognitive performance (Appendix 1).

Two of the measures identified in the review were specifically developed for use in intervention research in people with schizophrenia, but have not yet been used in published trials; the DAR was developed for clinical trials evaluating treatments targeting negative symptoms, and includes evaluation of negative symptoms thought to impact on functioning including judgement of motivation and initiation of activities. The SOFI was developed for use in trials of interventions aimed at reducing cognitive impairment, and as such focuses on any assistance or supervision needed across the various areas of functioning that it covers.

4. Discussion

4.1. Overview

This review demonstrates how the measurement of social functioning continues to be a complicated area, with an increasing number of measures that cover an expanding variety of domains. We identified 32 outcome measures of social functioning developed for or validated in a schizophrenia population since 2007. Measures involve the use of structured questionnaires, semi-structured interviews, and assessment of performance on specific tasks and cover eight broad areas of social functioning. Most measures assess ADLs, relationships and employment, but fewer address potentially important areas such as sexual functioning, antisocial behaviour and use of the internet and social media (Bjornestad et al., 2019). Newer, performance-based measures focus exclusively on ADLs and productive activity. A significant minority of measures feature items related to self-esteem, self-awareness, symptoms and other factors not usually considered part of social functioning, reflecting ongoing inconsistencies in its operationalisation identified in previous reviews (Burns and Patrick, 2007; Bellack et al., 2007). In contrast, most measures no longer incorporate items on positive symptoms, which have not been found to correlate with social functioning (Wunderink et al., 2013; Galderisi et al., 2018; Lin et al., 2013).

4.1.1. Intervention research

Social functioning is a key outcome for service users and reliable measures are required to evaluate how different interventions influence it (Schon et al., 2009). Researchers designing intervention research will want to select a measure based on the areas of functioning most relevant to their research, as well as considering the quality of measures, their practical features and use in previous research. Many measures have been developed in specific populations, for specific purposes, yet are used in situations other than those they were originally designed for, which may compromise their validity and reliability. Moreover, psychometric evaluation of floor and ceiling effects is rare, as well as responsiveness to change. Ecological validity is challenged by the age of some measures and a lack of measures capturing social media use (Bjornestad et al., 2019) and other important areas. Few measures distinguish between capacity and motivation, even though schizophrenia itself and antipsychotic drug treatment may compromise motivation specifically. Better discrimination might increase the sensitivity of measures and enable them to detect small gains that are valued by patients but which might not be appreciated by clinicians or assessors.

The measures included in this review have different strengths and weaknesses. In terms of overall quality, the range of quality scores was narrow but the PSP performed best, consistent with a previous review (Burns and Patrick, 2007). In terms of features which are particularly important for the design and interpretation of intervention research, the PSP is the only measure to demonstrate responsiveness (detecting changes over time), although this criterion was only evaluated in seven measures (22%). The PSP is the only measure for which a minimally clinically relevant effect is established (Nasrallah et al., 2008), but some research suggests there are concerns about its reliability (White et al., 2016). The FROGS and HONOS are the most comprehensive in terms of coverage of different areas of social functioning. The SFS and PSP have been used most frequently in intervention research since 1990.

Data are sparse on how measures compare with objective indicators of functioning or to what extent they reflect real-world functioning. Six measures, the TUS, SFS, DAR, Mini ICF APP, COALS and VRFCAT provide data demonstrating differences between patient and non-patient populations. Some other data supports the real-world validity of the PSP, SFS and UPSA-b, although other research did not confirm the real-world validity of the UPSA-b. A previous review described a paucity of measures that capture negative-symptom related deficits such as motivation and initiative to engage in activity (Mausbach et al., 2009). Our review identified one measure, The DAR, that was specifically designed

Table 4
Measures ordered by frequency of use in intervention research in schizophrenia spectrum disorders.

Measure	Number of times used	Avg. number of times used p/year since validation in schizophrenia	Primary outcome	Adaptations and validations in schizophrenia spectrum disorders
PSP	120	6	5	German version (Juckel et al., 2008), Portuguese (Brissos et al., 2012, Menezes et al., 2012), Mandarin (Wu et al., 2013), Thai version (Srisurapanont et al., 2008), Spanish (Apiquian et al., 2009, Garcia-Portilla et al., 2011) and Spanish adolescents (Ulloa et al., 2015), Chinese (Qiao et al., 2017)
SFS	115	4	12	Norwegian version (Hellvin et al., 2010), Spanish (Morejon and G-Boveda, 2000), German (Iffland et al., 2015), Korean (Kim and Lee, 2009), short version for clinical practice (Alonso et al., 2011), in Australian FEP sample (Chan et al., 2019).
SBS	18	1	6	Portuguese version (Jardim et al., 2015, Lima et al., 2006)
USPA brief	16	1	4	Portuguese version (Mantovani et al., 2015); Japanese (Sumiyoshi et al., 2014); Chinese (McIntosh et al., 2011); Spanish (Garcia-Portilla et al., 2013); Swedish (Olsson et al., 2012); Mobile app version (Moore et al., 2015)
FROGS	7	1	4	Chinese version (Wang et al., 2020); Turkish (Emiroğlu et al., 2009)
The SIX	4	<1	0	
MIRECC	4	<1	2	
GAF				
FESFS	3	<1	0	Chinese version (Wang et al., 2013)
Mini-ICF-APP	3	<1	0	Italian version (Pinna et al., 2015), Spanish inpatients (Egger et al., 2020)
Time Use survey	2	<1	2	
VRFCAT	2	<1	0	
SRCS	1	<1	0	
SOFI	1	<1	0	Spanish version (Al-Halabi et al., 2016)
COALS	1	<1	0	
BJ-Perfect	1	<1	0	Modification by adding items to the transportation and financial management domains (Zhao et al., 2019)
WHO DAS II	1	<1	0	Spanish version (Guilera et al., 2012), Korean (Lee and Da-Jeong, 2011), Dutch informant version (Koopmans et al., 2020)
ISSI	1	<1	0	

to reflect these areas.

Performance-based measures are narrower in focus, since they prioritise specific aspects of social functioning that can be easily assessed in a controlled setting. They have not yet been widely used in intervention research. The VFCAT and the USPA-brief are the strongest in terms of overall quality and the USPA-brief is the most commonly used.

Details about the practicalities of administration and psychometric properties are lacking for many measures. Available data indicates that some measures, including the DAR, the GMAP, SRCS and ICF scale, involve a considerable burden of data collection or duration of administration, which may make them impractical for use in large trials. There was little information on training requirements, and where it was described, training was not necessarily successful in achieving good reliability as in the case of non-clinicians administering the PSP (White et al., 2016).

Many recent measures feature items related to non-social and social cognition (25%), in line with developments in the field (Fett et al., 2011). Some performance-based measures may also share latent traits with cognition (Muhraib, 2018; Heinrichs et al., 2008; Harvey et al., 2020). However, research suggests that cognitive performance may not predict real-world social functioning (Bechi et al., 2017; Leifker et al., 2010; Menendes-Miranda et al., 2015), and that other factors, such as motivation may be more important (Muharib et al., 2014). Therefore, measures that have a major focus on cognitive function may not reflect real-world social functioning, as was shown with the study of the USPA-b (Granholm et al., 2020).

4.2. Future research

More research is needed on the basic psychometric properties of many measures including reliability, floor and ceiling effects, responsiveness to change, discriminative ability, clinically meaningful differences and associations with other indicators of social functioning. Few measures include potentially important areas such as sexual functioning, antisocial behaviour and use of social media and the internet, an increasingly important area (Bjornestad et al., 2019) especially since the

COVID-19 pandemic. New measures or modifications of existing measures are required to reflect these areas. Future research also needs to clarify whether a large quantity of detailed data improves the quality of measures, and if so, to explore the trade-off between the burden of data collection and validity. There is a need for further research on how to improve the reliability of the PSP when administered by non-clinicians.

Thirteen percent of measures identified in this review were developed in the US and Europe, and may not generalise to global contexts due to differing norms and cultural values (Brissos et al., 2011). While some measures have been adapted and psychometrically evaluated in different languages and countries, the cross-cultural priorities of service users and stakeholders need to be explored further.

4.3. Strengths and limitations

This review was conducted in line with PRISMA guidelines (Moher et al., 2009), and the protocol was published on PROSPERO. Two independent raters assessed eligibility of studies against pre-specified eligibility criteria and extracted data independently. This review aimed to identify and include all measures of social functioning, regardless of the method of assessment, in order to provide researchers with the best available information on content, use and quality, and an awareness of how the selection of a measure may influence the interpretation of findings. Papers reporting older (pre-2007) measures that have undergone further validation more recently were included in this review if they appeared in the last comprehensive review (Burns and Patrick, 2007), indicating their ongoing popularity.

Measures were excluded if they were not validated in a schizophrenia population, therefore some popular outcome measures validated in general samples may have been missed, and measures in languages other than English were not included. Due to the volume of articles retrieved, only a 10% sample of titles and abstracts were independently assessed for eligibility by a second rater. Psychometric properties were reported inconsistently and details about the practicalities of administration and training requirements were rarely provided. Where possible, authors were contacted for clarification, but

some important data could not be obtained. Grey literature was not searched; hence this review focuses on measures that have been published in peer-reviewed literature.

4.4. Conclusion

Numerous measures of social functioning now exist that have been validated in schizophrenia populations, but data on their strengths and limitations is sparse. We have presented the features of commonly used measures, including their practical features, content and coverage, quality and frequency of use. The highest quality measure based on current evidence is the Personal and Social Performance Scale (PSP, Morosini et al., 2000), which is one of the most commonly used in intervention research but may suffer from poor reliability in some scenarios (White et al., 2016). Overall differences between the quality of measures are modest. Researchers seeking to measure social functioning should select a measure whose content aligns with their main aims and theory of change (Coster, 2013), as well as considering practical issues of administration and performance on key validity and reliability criteria. Further work evaluating psychometric properties relevant to intervention research is urgently needed, particularly further validation of existing measures against indicators of real-life functioning.

Appendix 1. Use of measures in intervention research

Measure	Number of times used	Primary outcome	Details of studies that use the measure as primary outcome
SFS	115	12	<p>Cacciotti-Saija, C., Langdon, R., Ward, P.B., Hickie, I.B., Scott, E.M., Naismith, S.L., Moore, L., Alvares, G.A., Hodge, M.A.R., Guastella, A.J., 2015. A double-blind randomized controlled trial of oxytocin nasal spray and social cognition training for young people with early psychosis. <i>Schizophrenia Bulletin</i>, 41(2):483–493. https://doi.org/10.1093/schbul/sbu094</p> <p>Cather, C., 2005 Functional cognitive-behavioural therapy: a brief, individual treatment for functional impairments resulting from psychotic symptoms in schizophrenia. <i>The Canadian Journal of Psychiatry</i>. 2005;50(5):258–263. doi:https://doi.org/10.1177/070674370505000504</p> <p>Cook, S., Chambers, E., Coleman, J.H., 2009. Occupational therapy for people with psychotic conditions in community settings: a pilot randomized controlled trial. <i>Clinical Rehabilitation</i>. 23(1):40–52. https://doi.org/10.1177/0269215508098898</p> <p>Karaman, I.G.Y., Kasal, M.I., Ingeç, C., Yastibas, C., Gulyuksel, F., Gulec, M., 2020. Effect of adjunct psychosocial skills training on social functioning of schizophrenia patients who get occupational therapy in a community mental health centre: a comparative study. <i>Noro Psikiyatrisi Ars</i>. 57(3):248–253. https://dx.doi.org/10.29399/npa.24885</p> <p>Lee, H. J., Lee, D. B., Park, M. C., & Lee, S. Y., (2014). The Effect of Group Music Therapy on the Social Function and Interpersonal Relationship in Outpatients with Schizophrenia. <i>Journal of Korean Neuropsychiatric Association</i>, 53(1), 40–53.</p> <p>Lee, R.S.C., Redoblado-Hodge, M.A., Naismith, S.L., Hermens, D.F., Porter, M.A., Hickie, I.B., 2013. Cognitive remediation improves memory and psychosocial functioning in first-episode psychiatric out-patients. <i>Psychological Medicine</i>, Volume 43 (6): 1161–1173.</p> <p>Ng, R.M.K., Cheung, M.S.L., 2006. Social skills training in Hong Kong Chinese patients with chronic schizophrenia. <i>Hong Kong Journal of Psychiatry</i>. 16(1):14</p> <p>Slupczynska-Kossobudzka, E., Boguszewska, L., 1999. Effects of Community Mobile Team Intervention in the Drenwica Hospital Catchment Area. 1. Patient Outcome. <i>International Journal of Social Psychiatry</i>. 45(3):207–215. doi:https://doi.org/10.1177/002076409904500308</p> <p>Tas, C., Danaci, A.E., Cubukcuoglu, Z., Brune, M., 2012., Impact of family involvement on social cognition training in clinically stable outpatients with schizophrenia—a randomized pilot study. <i>Psychiatry Research</i>, 195(1–2):32–38.</p> <p>Tomás, E.P., Hurtado, G., Noguer, S., Domenech, C., Garcia, M., Lopez, N., Negrodo, M., Penades, R., Reinares, M., Serrano, D., Dolz, M., Gallo, P., 2011. Effectiveness of family work interventions on schizophrenia: Evidence from a multicentre study in Catalonia. <i>International Journal of Social Psychiatry</i>. 2012;58(6):587–595. doi:https://doi.org/10.1177/0020764011415595</p> <p>Waldheter, E.J., Penn, D.L., Perkins, D.O., Mueser, K.T., 2008. The graduated recovery intervention program for first episode psychosis: treatment development and preliminary data. <i>Community Ment Health J</i>. 44(4):443–444. https://doi.org/10.1007/s10597-008-9147-6</p> <p>Yildiz, M., Veznedaroglu, B., Eryavuz, A., Kayahan, B., 2004. Psychosocial skills training on social functioning and quality of life in the treatment of schizophrenia: a controlled study in Turkey. <i>International Journal of Psychiatry in Clinical Practice</i>, 8 (4): 219–225, https://doi.org/10.1080/13651500410005595</p>
PSP	120	5	<p>Chaichumni, N., Suttharangsee, W., & Saesia, W., 2015. The Effect of a Thai Culturally-Based Mutual Support Program: A Randomized Controlled Trial. <i>Pacific Rim International Journal of Nursing Research</i>, 19(2), 150–163. Retrieved from http://he02.tci-thaijo.org/index.php/PRIJNR/article/view/23550</p> <p>Charnsil, C., & Vongpanich, S., 2013. An open-label, prospective study to evaluate social function and overall improvement of extended-release paliperidone treatment in Thai schizophrenia patients. <i>Neuropsychiatric disease and treatment</i>, 9, 1223–1230. https://doi.org/10.2147/NDT.S47276</p> <p>Inchausti, F., Garcia-Poveda, N.V., Ballesteros-Prados, A., Ortuno-Sierra, J., Sanchez-Reales, S., Prado-Abril, J., Aldaz, -Armendariz, J.A., Mole, J., Dimaggio, G., Ottavi, P., Fonseca-Pedrero, E., 2018. The effects of metacognition-oriented social skills training on psychosocial outcome in schizophrenia-spectrum disorders: a randomised controlled trial. <i>Schizophrenia Bulletin</i>. 44(6):1235–1244. https://doi.org/10.1093/schbul/sbx168</p>

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Measure	Number of times used	Primary outcome	Details of studies that use the measure as primary outcome
SBS	18	5	Gigantesco, A., Vittorelli, M., Pioli, R., Falloon, I.R.H., Rossi, G., Morosini, P., 2006. The VADO approach in psychiatric rehabilitation: a randomised controlled trial. <i>Psychiatric Services</i> . 57(12):1178–1783.
			Shi, C., Yao, S.Q., Xu, Y.F., Shi, J.G., Xu, X.F., Zhang, C.P., Jun, H., Yu, X., 2016. Improvement in social and cognitive functioning associated with paliperidone extended-release treatment in patients with schizophrenia: a 24-week, single arm, open-label study. <i>Neuropsychiatr Dis Treat</i> . 12:2095–2104. https://doi.org/10.2147/NDT.S112542
			Leff, J., Szmidla, A., 2002. Evaluation of a special rehabilitation programme for patients who are difficult to place. <i>Soc Psychiatry Psychiatr Epidemiol</i> 37, 532–536 https://doi.org/10.1007/s00127-002-0578-z
			Marshall, J., Brand, H.J., Hanekom, J.M., 1993. Case study of a schizophrenic patient during social skills training in a forensic psychiatry ward. <i>Psychological Reports</i> . 72(1), 259–262. https://doi.org/10.2466/pr0.1993.72.1.259
			Wykes, T., Hayward, P., Thomas, N., Green, N., Surguladze, S., Fannon, D., Landau, S., 2005. What are the effects of group cognitive behaviour therapy for voices? A randomised controlled trial. <i>Schizophrenia Research</i> . 77(2–3):201–210. https://doi.org/10.1016/j.schres.2005.03.013
			Wykes, T., Leese, M., Taylor, R., Phelan, M., 1998. Effects of community services on disability and symptoms. <i>The British Journal of Psychiatry</i> . 173(5):385–390. https://doi.org/10.1192/bjp.173.5.385
			Webb, R., Mangrobang, J., Conning, A., & Orrell, M., 1993. A Social Therapy for Long-term Mentally III Inpatients: A Pilot Study. <i>Behavioural Psychotherapy</i> , 21(1), 57–62. https://doi.org/10.1017/S014134730001781X
			Harvey, P.D., Siu, C.O., Hsu, J., Cucchiaro, J., Maruff, P., Loebel, A., 2013. Effect of lurasidone on neurocognitive performance in patients with schizophrenia: a short-term placebo-and active-controlled study followed by a 6-month double-blind extension. <i>European Neuropsychopharmacology</i> . 23(11):1373–1382. https://doi.org/10.1016/j.euroneuro.2013.08.003
			Kantowitz, J.T., Sharif, Z., Medalia, A., Keefe, R.S.E., Harvey, P. Bruder, G., Barch, D.M., Choo, T., Lee, S., Lieberman, J.A., 2016. A multicenter, rater-blinded, randomised controlled study of auditory processing-focused cognitive remediation combined with open-label lurasidone in patients with schizophrenia and schizoaffective disorder. <i>The Journal of Clinical Psychiatry</i> . 77(6):799–806. https://doi.org/10.4088/JCP.15m09998
			Mendella, P.D., Burton, C.Z., Tasca, G.A., Roy, P., Louis, L.S., Twamley, E.W., 2013. Compensatory cognitive training for people with first-episode schizophrenia: results from a pilot randomised controlled trial. <i>Schizophrenia Research</i> . 162 (1–3):108–111. https://doi.org/10.1016/j.schres.2015.01.016
Rodriguez-Villa, Camacho, E., Torous, J., 2021. Psychiatric rehabilitation through teaching smartphone skills to improve functional outcomes in serious mental illness. <i>Internet Interventions</i> . 23: 100366. https://doi.org/10.1016/j.invent.2021.100366			
FROGS	7	4	Okanli, A., Karakas, S.A., Altun, O.S., Selvi, Y., 2017. The effect of the social and independent living skills, the community re-entry program application for patients with schizophrenia on their functional remission and drug adherence. <i>Studies on Ethno-Medicine</i> . 11(3): 233–238. https://doi.org/10.1080/09735070.2017.1305229
			Yilmaz, E., Okanli, A., 2017. Test of mindfulness-based psychosocial skills training to improve insight and functional recovery in schizophrenia. <i>Western Journal of Nursing Research</i> . 40(9):1357–1373. https://doi.org/10.1177/0193945917697222
			Yuksel, A., Bahadir-Yilmaz, E., 2021. The effect of mindfulness-based psychosocial skills training on functioning and insight level in patients with schizophrenia. <i>Community Mental Health Journal</i> . 57, 365–371. https://doi.org/10.1007/s10597-020-00658-9
			Yildiz, E., Aylaz, R., 2020. How counselling based on acceptance and commitment therapy and supported with motivational interviewing affects levels of functional recovery in patients diagnosed with schizophrenia: a quasi-experimental study. <i>Clinical Nursing Research</i> . 30(5): 599–615. https://doi.org/10.1177/1054773820935592
MIRECC GAF	4	2	Dixon, L.B., Goldman, H.H., Bennett, M.E., Wang, Y., McNamara, K.A., Mendon, S.J., Goldstein, A.B., Choi, C.W., Lee, R.J., Lieberman, J.A., Essock, S.M., 2015. Implemented coordinated specialty care for early psychosis: the RAISE connection program. <i>Psychiatric Services</i> . 66(7): 691–698. https://doi.org/10.1176/appi.ps.201400281
			Nossel, I., Wall, M.M., Scobes, J., Marino, L.A., Zikha, S., Bello, I., Malinovsky, I., Lee, R., Radigan, M., Smith, T.E., Sederer, L., Gu, G., Dixon, L., 2018. Results of a coordinated specialty care program for early psychosis and predictors of outcomes. <i>Psychiatric Services</i> . 69(8):863–870. https://doi.org/10.1176/appi.ps.201700436
Time Use survey	2	2	Fowler, D.F., Hodgekins, J., French, P., Marshall, M., Freemantle, N., McCrone, P., Everard, L., Lavis, A., Jones, P.B., Amos, T., Singh, S., Sharma, V., Birchwood, M., 2018. Social recovery therapy in combination with early intervention services for enhancement of social recovery in patients with first-episode psychosis (SUPEREDEN3): a single-blind randomised controlled trial. <i>The Lancet Psychiatry</i> . 5(1):41–50. https://doi.org/10.1016/S2215-0366(17)30476-5
			Priebe, S., Chevalier, A., Hamborg, T., Golden, E., King, M., Pistrang, N., 2020. Effectiveness of a volunteer befriending programme for patients with schizophrenia: randomised controlled trial. <i>The British Journal of Psychiatry</i> . 217(3): 477–483. https://doi.org/10.1192/bjp.2019.42 [Opens in a new window]
The SIX	4	0	
FESFS	3	0	
Mini-ICF-APP	3	0	
VRFCAT	2	0	
SRCS	1	0	
SOFI	1	0	
COALS	1	0	
BJ-Perfect	1	0	
WHO DAS II	1	0	
ISSI	1	0	

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