Psychiatry Research 339 (2024) 116111

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Review article

Sleep and socio-occupational functioning in adults with serious mental illness: A systematic review

Aviva Stafford [a,b,*], Sheri Oduola [c], Sarah Reeve [a,b]

[a] Norwich Medical School, University of East Anglia, Norwich, United Kingdom
[b] Cambridgeshire and Peterborough NHS Foundation Trust, United Kingdom
[c] School of Health Sciences, University of East Anglia, Norwich, United Kingdom

ARTICLE INFO

Keywords:
Schizophrenia
Psychosis
Bipolar disorder
Major depressive disorder
Sleep disturbance
Sleep disorder
Sleep-wake

ABSTRACT

Sleep is a crucial factor influencing mental health and quality of life. Individuals with serious mental illness (SMI) often experience significant sleep problems. This can further exacerbate their symptoms and impact their socio-occupational functioning (SOF) (the extent to which a person is able to engage in *'self-care and activities of daily living, communication, interpersonal relations, instrumental living skills, and work'*). Despite the well-established bidirectional relationship between sleep and mental health, the specific association between sleep and SOF in the context of SMI remains underexplored. A systematic review was conducted. Comprehensive searches in PubMed and PsycNet yielded 832 results. After applying inclusion criteria, 24 studies were included in the narrative synthesis. Study characteristics and key findings were extracted for analysis. Collectively, studies investigated sleep quality, satisfaction, duration, disturbance, specific disorders, and objectively-recorded sleep parameters across various study designs. Studies included a total population of 10,938, utilising a range of sleep and SOF outcome measures. Nearly all studies indicated that worsened sleep was associated with reduced SOF in SMI populations. The review supports the potential role of improved sleep as a route to improved SOF in SMI populations. This has clear implications for research and clinical care for patients with SMI.

1. Introduction

It is well established that sleep is essential for physical and mental health; as such sleep problems can increase susceptibility to mental health disorders, reduce quality of life, and negatively impact daily functioning (Freeman et al., 2020). Sleep problems are particularly prevalent in serious mental illness (SMI) (Scott et al., 2021a; Freeman et al., 2020; Laskemoen et al., 2019). SMI is understood throughout this review as a descriptor of psychotic disorders, bipolar disorder (BD), major depression, or anxiety disorders, eating disorders, and personality disorders in which the degree of functional impairment is severe (World Health Organization [WHO], 1993; Peck and Scheffier, 2002). More severe/chronic sleep problems tend to have a more detrimental effect on mental health, and vice versa, forming a bidirectional cycle. In addition, there are multiple overlapping biological and environmental risk factors that are known contributors to both sleep problems and SMI. For example, many people with SMI will have experienced childhood trauma (Varese, 2012) which places them at a much higher risk of insomnia (Grande et al., 2016; Benson, 2015), potentially via trauma-driven physiological, cognitive, and affective hyperarousal (Laskemoen et al., 2021).

The SMI population is generally associated with greater need and increased healthcare costs compared to those with primary, non-comorbid mental health disorders, such as mild to moderate anxiety, depression, or OCD (Somaiya et al., 2014). One potential contributor to this is sleep problems significantly impacting the onset, course, and treatment of mental ill health in SMI populations (Laskemoen et al., 2019). Sleep problems in SMI are associated with more suicide attempts, poorer clinical and cognitive functioning, lower quality of life, and higher mood episode relapse rates (Benson, 2015; Sylvia et al., 2012; Davies et al., 2017; Ritsner et al., 2004; Russo et al., 2015; Kanady et al., 2017). More research is needed to better understand the relationship between sleep and SMI, such as to what *extent* the severity of mental illness might be caused or maintained by poor sleep.

Socio-occupational functioning (SOF) can be defined (and is understood throughout this review) as the extent to which a person is able to engage in *'self-care and activities of daily living, communication and interpersonal relations, instrumental living skills, and work'* (Saraswat et al.,

* Corresponding author at: Norwich Medical School, University of East Anglia, Norwich, NR4 7TJ, United Kingdom
E-mail address: a.stafford@uea.ac.uk (A. Stafford).

https://doi.org/10.1016/j.psychres.2024.116111
Received 31 October 2023; Received in revised form 24 July 2024; Accepted 26 July 2024
Available online 27 July 2024

2006, p. 302). SMI is in part defined by its impact on functioning, and therefore it is unsurprising that SOF is significantly decreased and is identified as a treatment target within SMI populations. In fact, social recovery has been identified as the most valued treatment outcome by SMI groups (Douglas et al., 2022; Law and Morrison 2014). SOF in SMI groups predicts quality of life (Kuehner and Huffziger, 2009) and ability to live independently in the community. For example, better social skills were found to be associated with successfully attaining and retaining housing (Gabrielian et al., 2019). Bellido-Zanin et al. (2015) found that social functioning scores predicted the use of mental health resources in patients with SMI, with social isolation predicting greater need for hospitalisation. Additionally, unemployment rates for SMI populations are estimated to be between 61–73% in the UK (Waghorn and Lloyd, 2005), demonstrating the detrimental impact of reduced occupational functioning. Since SOF is reduced in SMI, it would be helpful to better understand if and to what extent this might be modified by sleep.

Sleep problems have been associated with decreased SOF in both SMI and non-clinical populations. In non-clinical populations, sleep problems have been associated with increased absences, workplace accidents, and decreases in career progression (Kucharczyk et al., 2012), reduced ability to accurately interpret social cues and effectively navigate social situations (Lunsford-Avery et al., 2019), reduced marital relationship quality (Troxel et al., 2007), increased reactivity to emotional stimuli and inappropriate processing of social information (Tempesta et al., 2018), and increased risk of social withdrawal and separation, which can become a reinforcing cycle (Ben Simon and Walker, 2018). In SMI populations, sleep problems have been linked to more problematic perceptions of social relationships, poorer social functioning in the community, smaller social networks, and poorer behavioral ratings of social competency (Blanchard et al., 2020).

Although there is some evidence pointing towards reduced SOF in SMI being partially explained by poor sleep, empirical research on the links between sleep, SOF, and SMI is lacking in comparison to that on the link between sleep and either mental health or quality of life. There are numerous reviews amalgamating findings of these aforementioned studies, however there are no such reviews at the time of writing that focus on sleep, SOF, and SMI. The primary aim of the present systematic review is therefore to explore whether sleep and SOF are positively associated within an SMI population. This would indicate that improving sleep in SMI (for which efficacy and acceptability is increasingly demonstrated (Freeman et al., 2015)) may have a secondary benefit on social functioning, which is an important treatment goal for patients and society.

2. Methods

2.1. Inclusion/exclusion criteria

Table 1 outlines study eligibility criteria using a PECO framework (Morgan et al., 2018). This systematic search protocol was pre-registered in PROSPERO (registration number: CRD42023393724).

Table 1
Inclusion and exclusion criteria.

	Inclusion	Exclusion
Population	Adults who meet criteria for a SMI diagnosis (schizophrenia, schizotypal, delusional, and affective disorders)	Individuals who do not meet criteria for a SMI diagnosis
Exposure	Participants with sleep problems	Studies that do not include participants with sleep problems
Comparison	N/A	N/A
Outcomes	A measurement or qualitative focus on the direct association between sleep and SOF	No measurement or qualitative focus on the direct link between sleep and SOF

The primary criteria for studies to be included are as follows:

1) SMI participant population (as defined above)
2) Assessment of sleep
3) Assessment of SOF (see Appendix A for operationalised search terms)
4) Association between sleep and SOF analysed directly (e.g., one is an independent variable and one is a dependent variable)

Eligible studies were also required to be peer-reviewed, English-language, and published from 1993 onwards in order to conform to the ICD-10 (WHO, 1993) establishment of SMI criteria (F20–F39).

Case studies, grey literature, and studies where participants were primarily under the age of 16 were excluded.

2.2. Search strategy

Searches were run via PubMed (National Institutes of Health, 2024) and APA PsycNet (American Psychological Association, 2024) databases.

Originally, a scoping search was conducted, and the first 200 papers were reviewed. Through this process, and by reviewing papers reporting on SOF measures (e.g., Akers et al., 2019; Long et al., 2022), more relevant search terms were discovered (i.e., a wide variety of sleep and SOF measures) and added to the search strategy. The search terms ultimately utilized across both databases (detailed in Appendix A) included three comprehensive lists of terms relating to 1) patient-identifying condition outcomes (SMI descriptors), 2) sleep descriptors and sleep measures, and 3) SOF descriptors and SOF measures, and excluding the terms 'dementia' and 'Parkinso*' which otherwise contributed many irrelevant results.

Searching PubMed database using on 27/01/23 generated 691 results, andsearching PsycNet on 02/02/23 generated 539 results (398 of which were duplicates). Of these 1230 papers, the duplicates and 796 articles that did not meet inclusion criteria were excluded. Thirty-six of the papers from PubMed were retained and no additional papers were retained via PsycNet. References of the retained studies were hand-searched to assess for further suitable papers, resulting in two additional papers being identified. Subsequently, 38 articles were reviewed in full. Of these, 14 did not meet our inclusion criteria, two because the population was not strictly SMI-focused, four because no measure of social functioning was included (only occupational), and eight because sleep and SOF were both dependent variables meaning no meaninful conclusions about their association could be drawn. In instances where eligibility of particular papers was not clear, they were discussed between all authors to meet consensus. A total of 24 studies relating to sleep problems and SOF within an SMI population were ultimately retained to be included in the narrative synthesis (see Fig. 1).

2.3. Quality appraisal

The methodological quality of the studies was assessed using the Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018). Depending on study type, studies were assessed for randomisation, assessor blindness, confounders, data completion level, participant adherence, participant representativeness, appropriateness of measures, and appropriateness of statistical analysis. Based on the ratings of each primary component, the studies received a quality percentage rating. The quality assessments were completed by the primary author (AS) and any issues were resolved through discussion amongst all authors. The studies are otherwise summarised using narrative synthesis.

2.4. Data analysis

The following data were extracted from the studies retained for analysis: country, participant genders and ages, number of participants, study design, sleep measures, SOF measures, relevant findings. A

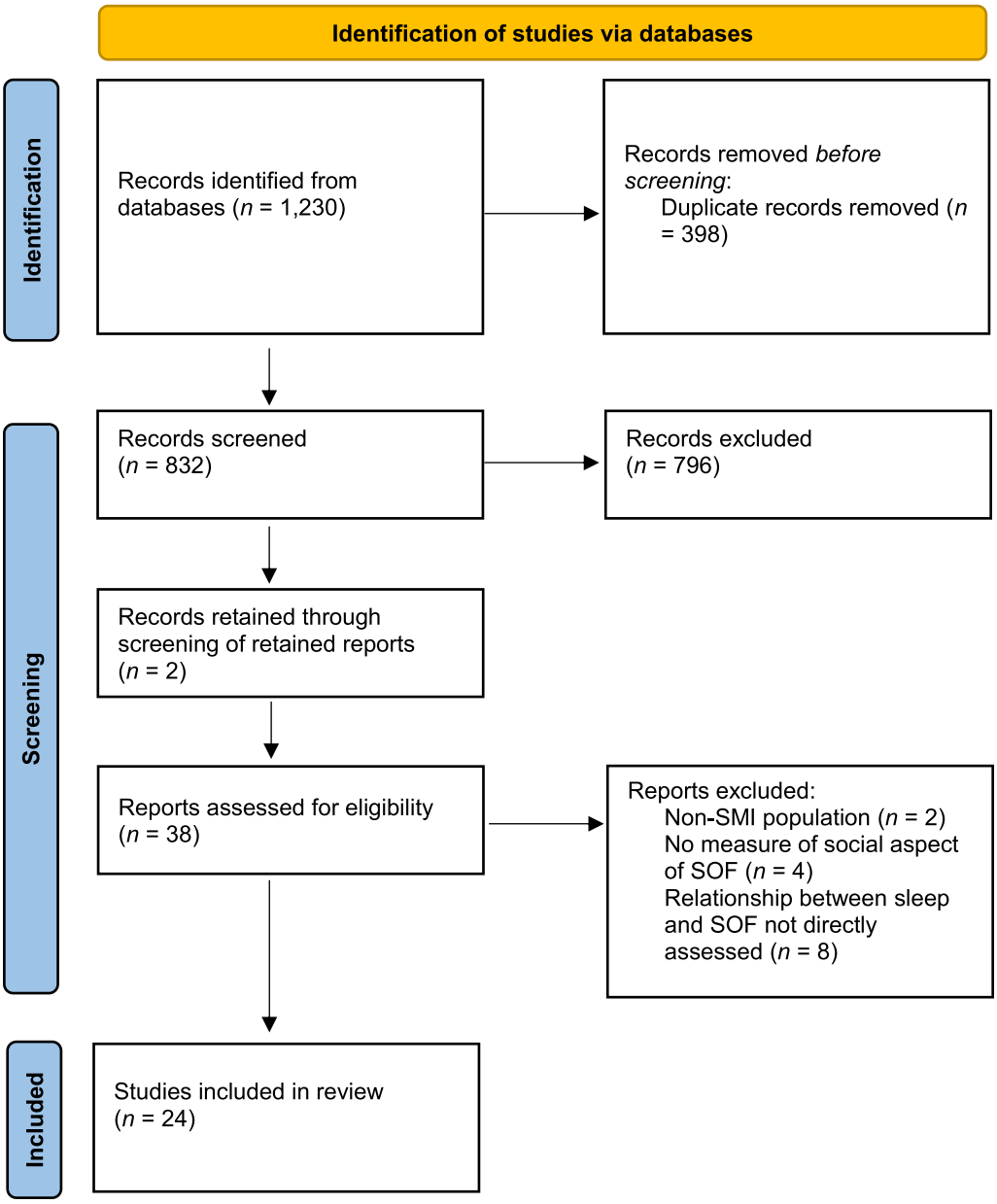

Fig. 1. Study selection process.

narrative synthesis was then carried out, firstly by identifying common themes across the studies, then examining links between them more closely.

3. Results

3.1. Study characteristics

Study characteristics are outlined in Table 2. All but two studies (Batalla-Martín et al., 2022 and Faulkner and Bee, 2017) were quantitative. Twenty-one of the studies employed a cross-sectional design, one was a longitudinal cohort study, and the two qualitative studies used interpretative and/or phenomenological analysis. Study populations covered a range of SMI groups; 13 were schizophrenia-spectrum disorders only (two of which were first-episode psychosis), seven were BD only, and four were a combination of SMI diagnoses. Sample sizes for SMI populations ranged from 15 (Faulkner and Bee, 2017) to 2024 (Gruber et al., 2009), with a mean of 456. There was a combined sample size of 10,938 SMI individuals. Most participants were middle-aged adults (range = 28–48.8 years). Percentages of male participants ranged between studies from 28 % to 69 %. Ethnicity was only reported in eight out the 24 studies. The studies were conducted in a wide variety of countries including Norway, Japan, Singapore, Brazil, France, Tunisia, China, USA, Germany, Spain, UK, Taiwan, Portugal, and Switzerland.

3.2. Quality assessment

Methodological quality of studies varied (see Table 2). Quality percentages calculated using the MMAT ranged between 60 % and 100 %, with a mean of 94.2 %. Limitations were generally due to low participant numbers, incomplete outcome data, or presence of confounding factors such as lack of randomisation. One limitation that was discussed by authors was that multiple studies made no clear account of medication differences between groups, however since it would have been impossible to account for all potentially confounding factors (e.g.,

Table 2
MMAT quality assessment.

			Qualitative criterion					Quantitative criterion					Quality percentage%
Study	S1	S2	1	2	3	4	5	6	7	8	9	10	
Laskemoen et al. (2021)	Y	Y						Y	Y	Y	Y	Y	100
Baba et al. (2022)	Y	Y						Y	Y	Y	Y	Y	100
Ong et al. (2020)	Y	Y						Y	Y	Y	Y	Y	100
Matsui et al. (2021)	Y	Y						Y	Y	Y	Y	Y	100
Laskemoen et al. (2019)	Y	Y						Y	Y	Y	CT	Y	80
Giglio et al. (2009)	Y	Y						Y	Y	Y	CT	Y	80
Walz et al. (2013)	Y	Y						Y	Y	Y	Y	Y	100
Fekih et al. (2021)	Y	Y						Y	Y	Y	Y	Y	100
Chung et al. (2018)	Y	Y						Y	Y	Y	Y	Y	100
Blanchard et al. (2020)	Y	Y						Y	Y	Y	Y	Y	100
Wang et al. (2020)	Y	Y						Y	Y	Y	Y	Y	100
Drews et al. (2018)	Y	Y						Y	N	Y	Y	Y	80
De la Fuente-Tomás et al. (2018)	Y	Y						Y	Y	Y	Y	Y	100
Bradley et al. (2017)	Y	Y						Y	Y	Y	CT	Y	80
Lai et al. (2014)	Y	Y						Y	Y	Y	Y	Y	100
Gruber et al. (2009)	Y	Y						Y	Y	Y	Y	Y	100
Mulligan et al. (2016)	Y	Y						Y	Y	Y	Y	Y	100
Afonso et al. (2015)	Y	Y						Y	Y	Y	Y	Y	100
Si et al. (2019)	Y	Y						Y	CT	Y	CT	Y	60
Vauth et al. (2021)	Y	Y						CT	Y	Y	Y	Y	80
Gruber et al. (2011)	Y	Y						Y	Y	Y	Y	Y	100
Batalla-Martín et al. (2022)	Y	Y	Y	Y	Y	Y	Y						100
Faulkner & Bee (2017)	Y	Y	Y	Y	Y	Y	Y						100

Y = yes; CT = can't tell.

symptom status, employment prior to being unwell, education status) it was agreed this would not affect quality score. The exception was when there was a reason to believe that differences in these factors between groups affected/explained the results. The authors agreed a maximum acceptable withdrawal/drop-out rate as 20%, based on the rule of thumb by Furlan et al. (2009).

3.3. Assessment tools

Outcome assessment tools included various subjective and objective measures. The Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989), a self-report questionnaire designed to measure sleep quality, duration, and disturbance, was the most frequently used tool ($n = 14$) for measuring sleep. Despite the PSQI obtaining some objective sleep properties such as sleep duration, it amalgamates multiple sleep properties into one 'total' score, preventing us from distinguishing key influential aspects. For the purposes of this review, we have therefore categorised the PSQI as an indicator of overall sleep *quality*.

The Global Assessment of Functioning (GAF) (Piersma and Boes, 1997), a subjective questionnaire which rates psychological, social, and occupational functioning, and the Personal Social Performance scale (PSP) (Morosini et al., 2000), a subjective questionnaire which assesses functioning across 'socially useful activities', 'personal and social relationships', 'self-care', and 'disturbing and aggressive behaviours', were the two most frequently used tools ($n = 9$ and 7 respectively) for measuring SOF.

The two qualitative studies used semi-structured interviews to assess participants' subjective experiences of SOF.

3.4. Primary findings

The results of the retained studies are collated in Table 3. Nearly all studies supported that sleep is associated with SOF in SMI populations. Six of the 22 quantitative studies did not produce statistically significant results in all measures, however the direction of the relationship between sleep and SOF was consistent in all cases. Only nine of the 24 studies reported effect sizes for the outcomes of interest and these ranged from small to large. Results below are presented according to four categories. These are studies whose primary findings are about 1) sleep quality/satisfaction, 2) sleep duration, 3) sleep disorder/disturbance, and 4) objectively-derived sleep properties (i.e., sleep efficiency, sleep stage).

3.4.1. Relationship between sleep quality or satisfaction and SOF

Ten studies assessed sleep quality and/or satisfaction in relation to SOF, nine of which were quantitative and cross-sectional by design and one qualitative study which used interpretative phenomenological analysis. Eight included the PSQI as a sleep assessment tool. Seven focused specifically on schizophrenia or psychosis, two focused specifically on BD, and one focused on participants with mixed SMI diagnoses. Improved sleep quality and/or sleep satisfaction tended to be associated with improved SOF across studies (though not always significantly).

One example of a study that found a significant effect of sleep quality on SOF is Lai et al. (2014). They found that the percentage of moderate to very severe functional impairment was higher in participants with poor sleep quality across domains of physical health, psychological health, social relationships, and environment (67.5–78.8 % during depressive episode and 59.7–69.4 % during manic episode), compared to participants with good quality sleep (41.7–62.5 % during depressive episode and 40.0–53.3 % during manic episode). Participants with poor quality sleep also reported having significantly more severe impairment for work disability, social life disability, and family life disability than those with good quality sleep.

Eight other studies (Ong et al., 2020; Walz et al., 2013; Samalin et al., 2017; Fekih et al., 2021; Wang et al., 2020; Afonso et al., 2015; Si et al., 2019; and Vauth et al., 2021) also measured sleep quality. Of these, all but Samalin et al. (2017) found a significant direct association between sleep quality and SOF. However, Samalin et al. (2017) *did* find a significant indirect association between sleep quality and SOF via residual depressive symptoms and perceived cognitive performance. Walz et al. (2013) and Fekih et al. (2021) also found a significant association between sleepiness (as measured by the Epworth Sleepiness Scale) and SOF.

The qualitative study by Faulkner and Bee (2017) reported an interpretative phenomenological analysis of interviews with patients with schizophrenia and comorbid poor-quality sleep. Participants reported that worse sleep was linked with 'loss of jobs and friends' and 'a reduced ability or opportunity to participate in valued activities'. SOF

Table 3
Results.

Reference	Country	Participant characteristics	*n*	Study design	Sleep measure(s)	SOF measure(s)	Relevant findings	Is sleep associated with SOF? (*Y* = yes; NS = non-significantly)	Effect size
Afonso et al. (2015)	Portugal	Sample = adult outpatients with a diagnosis of schizophrenia. Age (mean and SD) = 42.7 (11.64) in the no sleep disturbance group and 42.4 (11.72) in the sleep disturbance group. Male (*n* and%) = 270 (66%) in the no sleep disturbance group and 270 (67%) in the sleep disturbance group.	811	Cross-sectional	PSQI	PSP	Socio-occupational functioning as measured by the PSP was significantly correlated with sleep quality (r = -.233, $p < .001$).	Y ($p < .001$)	r = -.233
Faulkner and Bee (2017)	UK	Sample = adult patients with schizophrenia, schizoaffective disorder, or delusional disorder. Age (mean and SD) = 45 (10.55). Male (*n* and%) = 10 (67%).	15	Interpretative Phenomenological Analysis	PSQI	Semi-structured interviews	Sleep quality was linked with loss of jobs, friends, and a reduced ability or opportunity to participate in valued activities. SOF benefits attributed to adequate sleep included feeling more sociable, increased energy and motivation, and thinking more clearly. Participants described work and occupational goals, acknowledging that many of these were contingent on adequate amount and quality of sleep.	Y (N/A)	Unavailable
Lai et al. (2014)	Taiwan	Sample = major depressive and bipolar disorders, first-degree relatives, and healthy controls. Age (mean and SD) = 35.48 (12.36) in BD group, 45.62 (12.53) in MDD group, 46.30 (13.88) in affected relatives, 48.82 (15.11) in non-affected relatives, 47.43 (8.53) in healthy controls. Male (*n* and%) = 173 (47.66%) in disorder group, 49 (31.21%) in relatives' group, 23 (34.85%) in healthy controls group.	1276	Cross-sectional	PSQI	WHOQOL-BREF and SDS	Mood disorder patients with good sleep quality reported significantly better satisfaction in all four domains of SOF as measured by WHOQOL-BREF (physical health, psychological, social relationships, and environment) than patients with poor sleep quality ($p < .001$). The percentage of moderate to very severe impairment according to SDS was higher in the poor sleeper group across all four domains (home, work, relationships, social) of functional impairment (67.5–78.8 % during a depressive episode and 59.7–69.4 % during a manic episode), compared with the good sleeper group (41.7–62.5 % during a depressive episode and 40.0–53.3 % during a manic episode). For the overall role impairment score, poor sleepers reported having significantly more severe impairment than good sleepers (*b*	Y ($ps < .05$ – $.001$)	Unavailable

(*continued on next page*)

Table 3 (*continued*)

Reference	Country	Participant characteristics	*n*	Study design	Sleep measure(s)	SOF measure(s)	Relevant findings	Is sleep associated with SOF? (Y = yes; NS = non-significantly)	Effect size
							= 1.47, p = .007 during a depressive episode and b = 1.35, p = .043 during a manic episode).		
Ong et al. (2020)	Singapore	Sample = First episode psychosis. Mean age not provided. Male (*n* and%) = 142 (50.7%).	280	Cross-sectional	PSQI	WHOQOL-BREF	Poor sleep quality as measured by PSQI was significantly associated with lower social and occupational functioning scores as measured by the WHOQOL-BREF domains (physical health domain b = −2.236, p < .001; psychological domain b = −1.967, p < .001; social relationship domain b = −1.376, p = .003; environment domain b = −1.655, p < .001).	Y (*p*s = .003 – .001)	Unavailable
Samalin et al. (2017)	France	Sample = BD outpatients. Age (mean and SD) = 47.7 (12.5). Male (*n* and%) = 192 (41%).	468	Cross-sectional	PSQI	FAST	The direct pathway between sleep quality and SOF was not significant (path coefficient = .04; p = .491). However, sleep quality was indirectly associated with SOF via residual depressive symptoms and perceived cognitive performance (path coefficient = .23; p < .001).	Partially NS (*p*s = .491 – .001)	path coefficient = 0.23 (regarding indirect association)
Wang et al. (2020)	China	Sample = inpatients with schizophrenia. Age (mean and SD) = 42.26 (10.02). Male (*n* and %) = 137 (66.2%).	207	Cross-sectional	PSQI	PSP	Univariate logistic regression analysis demonstrated a significant association between sleep quality and PSP score (T = −3.35, p = .001).	Y (p = .001)	Unavailable
Fekih et al. (2021)	Tunisia	Sample = first-episode schizophrenia patients, their unaffected siblings, and healthy controls. Age (mean and SD) = 26.8 (6.1) in patients, 28.6 (4.8) in siblings, and 27.9 (5.5) in controls. Male (*n* and%) = 35 (75%) in patients, 34 (60.7%) in siblings, and 44 (72.1%) in controls.	171	Cross-sectional	PSQI	GAF	Sleep quality and SOF were found to be positively correlated (p < .05). (Note, these findings were minimally reported on.)	Y (p < .05)	Unavailable
Walz et al. (2013)	Brazil	Sample = outpatients with BD. Age (mean and SD) = 43.5 (12.3) in BD sample and 45.8 (12.7) in control group. Male (*n* and%) = 23 (29%) in BD sample and 21 (26.2%) in control group.	160	Cross-sectional	ESS and PSQI	FAST	The regression model retained group (b = .73, p = .001), sleep quality (b = .87, p < .001) and sleepiness (b .44, p = .009) as independent predictors of higher FAST scores, but not the use of sleep medication (p = .162).	Y (*p*s < .009 – .001)	Unavailable
Si et al. (2019)	China	Sample = adults with diagnosis of schizophrenia. Age (mean and SD) = 32.4 (11.31). Male (*n* and %) = 289 (48.01%).	602	Cross-sectional	Daytime sleepiness and quality of sleep scores	PSP	Daytime sleepiness had a negative correlation, while quality of sleep had a positive correlation with PSP total score at endpoint. Sleep quality influenced the PSP total score <70 at endpoint (OR 1.03, CI	Y (all *p*s < .001)	ORs = 0.98 – 1.03

(*continued on next page*)

Table 3 (*continued*)

Reference	Country	Participant characteristics	*n*	Study design	Sleep measure(s)	SOF measure(s)	Relevant findings	Is sleep associated with SOF? (*Y* = yes; NS = non-significantly)	Effect size
							1.02–1.05, $p < .001$) and daytime drowsiness had slightly lesser odds of PSP total score <70 at endpoint (OR 0.98, CI 0.97–0.99, $p < .001$).		
Vauth et al. (2021)	Switzerland	Sample = adult patients with nonacute but symptomatic schizophrenia, who had previously been unsuccessfully treated with oral antipsychotics. Age (mean and SD) = 40.1 (12.6). Male (*n* and%) = 1086 (59.9%).	1812	Cross-sectional	Sleep quality and daytime drowsiness scales	PSP	Sleep quality (OR 1.172, CI 1.127–1.219, $p < .001$) and daytime drowsiness (OR .882, CI .852–.914, $p < .001$) were, along with other clinical outcomes, significant predictors of SOF.	Y (all *ps* < .001)	ORs = 0.882 – 1.172
De la Fuente-Tomás et al. (2018)	Spain	Sample = euthymic BD outpatients. Age (mean and SD) = 46.3 (12.2). Male (*n* and%) = 41 (34.5%).	119	Secondary analysis of a cross-sectional study	OSQ	FAST and GAF	The results of the hierarchical multiple regression showed that, after controlling by age, caffeine consumption, number of drugs and use of benzodiazepines, only sleep duration* (long sleep duration group: b =.279, $p = .013$) remained in the model [F (5, 93) = 2.666, $p = .027$]. The model explained 12.5% of the variance in the total FAST score. The same result was found in the case of the GAF (long sleep duration group: $b = -.245$, $p = .021$). This model explained 14.8% of the variance [F (5, 101) = 3.516, $p = .006$]. Among the different functioning dimensions evaluated in the FAST scale, only the occupational dimension obtained a significant model. This model explained 18% of the variance in the FAST occupational score [F (5, 94) = 4.129, $p = .002$]. In this case, the cofounding factor 'number cups of coffee per day' was retained ($b = -.251$, $p = .012$) along with sleep duration (long sleep duration group: $b = .311$, $p = .004$). In summary, long sleep duration, but not short sleep duration, was significantly associated with worse SOF as measured by the GAF and worse occupational functioning as measured by the FAST. There was no significant association between low sleep satisfaction and SOF.	Partially NS (*ps* < .027 – .002)	Unavailable

(*continued on next page*)

Table 3 (*continued*)

Reference	Country	Participant characteristics	*n*	Study design	Sleep measure(s)	SOF measure(s)	Relevant findings	Is sleep associated with SOF? (*Y* = yes; NS = non-significantly)	Effect size
							*'Normal sleepers' = 6.5–8.5 h slept per night (n = 65); 'short sleepers' ≤ 6 h slept per night (n = 12); 'long sleepers' ≥ 9 h slept per night (n = 33).		
Gruber et al. (2009)	USA	Sample = BD patients. Age (mean and SD) = 38.00 (13.07). Male (n and%) = 893 (44.1%).	2024	Cross-sectional	Average total sleep time in the past week and sleep variability via Clinical Monitoring Form	GAF and LIFE-RIFT	Self-reported short and long sleep duration was associated with worse SOF compared to normal sleep duration as measured by the GAF ($F(2) = 27.95$, $p < .001$) and the LIFE-RIFT (work $F(2) = 12.91$, $p < .001$; relationships $F(2) = 12.72$, $p < .001$; recreation $F(2) = 25.99$, $p < .001$; satisfaction $F(2) = 26.50$, $p < .001$).	Y (all *ps* < .001)	Unavailable
Gruber et al. (2011)	USA	Sample = patients aged 15 years or older with BD. Age (mean and SD) = 38.87 (14.35). Male (n and %) = 85 (43.3%).	196	Cross-sectional	Average total sleep time in the past week and sleep variability (SV) via Clinical Monitoring Form	GAF	There was no relationship over time between total sleep time and SOF [F (1, 1313) = .72, p = .40]. Improved sleep variability over time was associated with better SOF [F (1,1330) = 7.99, $p < .01$], although this association was no longer significant once SUM-M and SUM-D scores were covaried [F (1, 1268) = .34, $p < .10$].	NS (*ps* < .40 – .10)	Unavailable
Baba et al. (2022)	Japan	Sample = Respondents who self-reported a physician diagnosis of schizophrenia. Age (mean and SD) = 42.70 (14.38). Male (n and %) = 89 (50%).	178	Cross-sectional	NHWS	SF-12v2 (social), EQ-5D (occupational), and WPAI	Participants with sleep disturbances had poorer social functioning (lower mental component score (43.02 vs. 47.91, p = .004 and lower role component scores (29.14 vs. 38.56, $p < .001$)) as measured by the SF-12v2 ($p <$ .001), and poorer occupational functioning as measured by the EQ-5D (0.65 vs. 0.75, $p < .001$) compared to patients with normal sleep. Participants with sleep disturbance also had significantly higher absenteeism (26.11 % vs. 7.20%, p = .001), presenteeism impairment (53.11 % vs. 29.77 %, p = .001), total work productivity impairment (63.16 % vs. 32.00 %, $p < .001$), and total activity impairment (53.30 % vs. 34.67 %, $p < .001$), indicating lower occupational functioning across specific domains.	Y (*ps* < .001 - < .004)	Unavailable

(*continued on next page*)

Table 3 (*continued*)

Reference	Country	Participant characteristics	*n*	Study design	Sleep measure(s)	SOF measure(s)	Relevant findings	Is sleep associated with SOF? (*Y* = yes; NS = non-significantly)	Effect size
Batalla-Martín et al. (2022)	Spain	Sample = adult patients with schizophrenia. Age (mean and SD) = 53 (±10.83) for severe-moderate insomnia, 52 (±14.10) for mild insomnia, 49 (±15.25) for no insomnia. Male (*n* and%) = 8 (88.9%) for severe-moderate insomnia, 5 (41.7%) for mild insomnia, 6 (60.0%) for no insomnia.	31	Descriptive and interpretative analysis	ISI and OSQ	Semi-structured interviews	Patients with insomnia described consequences of poor sleep as including feeling down with no energy, feeing nervous and anxious, restlessness, a lack of motivation, difficulties concentrating and in performance, memory problems, bad moods, difficulty getting up, irritability, apathy.	Y (N/A)	Unavailable
Blanchard et al. (2020)	USA	Sample = individuals with a variety of psychotic disorders and healthy non-clinical participants. Age (mean and SD) = 44.44 (11.66). Male (*n* and%) = 55 (61.1%).	90	Cross-sectional	PROMIS	ASRS (social), SLOF (both), SNI (social), and UPSA (social)	ASRS scores indicated greater sleep disturbance and sleep-related impairment were related to lower perceived emotional support (but not instrumental support), lower ratings of friendship, greater loneliness (*r*s = −.25 to −.28, *p*s < .05), and greater perceived social rejection and hostility from others (*r*s = .36 to .44, *p*s < .01). SLOF scores indicated greater sleep disturbance and sleep-related impairment were associated with poorer functioning across all domains with the exception of activities (*r*s = −.25 to −.50, *p*s < .05). SNI scores indicated greater sleep disturbance (but not sleep-related impairment) was related to smaller social networks (*r* = −.22, *p* < .05). UPSA scores indicated greater sleep disturbance and sleep-related impairment were related to poorer social competence as measured by ratings of communication skills (*r*s = −.26 and −.33 respectively, *p*s < .05).	Y (*p*s < .01 – .05)	*r*s = −.22 to −.50
Giglio et al. (2009)	Brazil	Sample = BD patients. Age (mean and SD) = 40.26 (9.75) in normal sleep group and 44.05 (12.08) in dysfunctional sleep group. Gender not provided.	190	Cross-sectional	Questions 4, 5 and 6 of the HDRS	GAF and SDS	Patients with insomnia scored significantly lower on the GAF than patients without insomnia (*t* (178) = 3.101, *p* = .002). Patients with insomnia also scored higher (indicating more impairment) on the work (*t*(178) = −4.595, *p* = .001), social (*t*(178) = −3.801, *p* = .001), and familial (*t*(178) = −3.523, *p* = .001) sub-scales of the SDS.	Y (*p*s = .002 – .001)	Unavailable

(*continued on next page*)

Table 3 (*continued*)

Reference	Country	Participant characteristics	*n*	Study design	Sleep measure(s)	SOF measure(s)	Relevant findings	Is sleep associated with SOF? (*Y* = yes; NS = non-significantly)	Effect size
Laskemoen et al. (2019)	Norway	Sample = schizophrenia spectrum and Bipolar disorders. Age (mean and SD) = 30.7 (9.8) in schizophrenia group, 34.0 (12.0) in BD group, and 34.8 (10.1) in healthy controls group. Male (*n* and%) = 353 (57.2%) in schizophrenia group, 171 (40.5%) in BD group, and 124 (55%).	1230	Cross-sectional	The first four items of IDS-C	The functioning subscale of the GAF	Sleep disturbances (insomnia, hypersomnia, and delayed sleep phase) were significantly associated with decreased SOF across diagnostic groups (η^2 = .007, $p < .001$).	Y ($p < .001$)	$\eta^2 = .007$
Laskemoen et al. (2021)	Norway	Sample = schizophrenia-spectrum ($n = 418$) and Bipolar ($n = 348$) disorders. Age (mean and SD) = 31.6 (10.6). Male (*n* and%) = 384 (50.1 %)	766	Cross-sectional	The first four items of IDS-C	The functioning subscale of the GAF	Insomnia was significantly correlated with SOF ($r = -.158$, $p < .001$).	Y ($p < .001$)	$r = -.158$
Matsui et al. (2021)	Japan	Sample = Outpatients with schizophrenia. Age (mean and SD) = 47.5 (12.6). Male (*n* and %) = 45 (42.9%).	105	Cross-sectional	ISI, clinical interview, and sleep diary	GAF	There were trends toward lower GAF scores in the Circadian Rhythm Sleep-Wake Disorder (CRSWD) group ($n = 19$) ($p < .05$) compared to the non-CRSWD group ($n = 86$), although this was not significant following a false discovery rate correction (p = .033).	NS ($p = .033$)	Unavailable
Mulligan et al. (2016)	UK	Sample = patients with a diagnosis of schizophrenia. Age (mean and SD) = 37.4 (10.4). Male (*n* and%) = 13 (59 %).	22	Cross-sectional	ISI, actigraphy, CSD, and BSSD	PSP	Greater objective (standardized β coefficient = .4139, $p < .001$) and subjective (standardized β coefficient = 0.2558, $p < .001$) sleep efficiency, subjective sleep quality (standardized β coefficient = 4.094, $p < .001$), and objective (standardized β coefficient = .0242, $p = .001$) and subjective (standardized β coefficient = .0208, $p = .001$) total sleep time predicted greater next-day functioning scores, whilst greater objective sleep fragmentation predicted decreased next-day functioning (standardized β coefficient = 0.1947, $p < .001$),	Y (all *ps* ≤ .001)	standardised β coefficients = .0208 – .4139

(*continued on next page*)

Table 3 (*continued*)

Reference	Country	Participant characteristics	*n*	Study design	Sleep measure(s)	SOF measure(s)	Relevant findings	Is sleep associated with SOF? (*Y* = yes; NS = non-significantly)	Effect size
							after adjusting for baseline PANSS scores.		
Bradley et al. (2017)	UK	Sample = patients with BD compared to matched controls. Age (mean and SD) = 48.8 (11.1) in BD patients and 42.5 (11.9) in controls. Male (*n* and%) = 15 (32.6 %) in BD patients and 13 (31 %) in controls.	88	Cross-sectional	Triaxial wrist accelerometer	FAST	There was significantly poorer SOF in patients with disturbed sleep (including circadian rhythm disturbance and moderately severe obstructive sleep apnoea) (t = 3.033, $p < 0.004$) compared to patients with normal sleep.	Y ($p < .004$)	Unavailable
Chung et al. (2018)	China	Sample = schizophrenia patients with delayed sleep-wake phase and normal sleep-wake phase. Age (mean and SD) = 44.08 (12.64). Male (*n* and%) = 30 (45.45 %).	66	Cross-sectional	Actigraphy and sleep diary	SOFAS and SRM-5	Sleep irregularity (based on participants with delayed sleep-wake phase) was not found to be significantly associated with SOF as measured by SOFAS (exact significance scores unavailable), though it was significantly positively associated with symptoms of 'social rhythm irregularity' as measured by SRM-5. Specifically, higher irregularity in time in bed ($b = -.74$, $p < .001$), sleep efficiency ($b = -.30$, p = .006), and total sleep time (b = $-.64$, $p < .001$)) (but not sleep onset latency, wake after sleep onset, or number of awakenings), as measured by actigraphy, were significantly associated with social rhythm irregularity. Higher irregularity in bedtime and wake time ($b = -1.34$, $p < .001$), sleep efficiency ($b = -.30$, p = .005), total sleep time ($b = -.70$, p < .001), and greater variability in the level of refreshment upon awakening ($b = -.13$, $p < .001$) (but not higher irregularity in sleep onset latency, wake after sleep onset, or nap duration), as measured by sleep diary, were	Partially NS (significant *p*s < .001 – .006)	Unavailable

(*continued on next page*)

Table 3 (*continued*)

Reference	Country	Participant characteristics	*n*	Study design	Sleep measure(s)	SOF measure(s)	Relevant findings	Is sleep associated with SOF? (Y = yes; NS = non-significantly)	Effect size
							significantly associated with social rhythm irregularity.		
Drews et al. (2018)	Germany	Sample = patients with either schizophrenia (n = 15) or major depression (n = 16). Age (mean and SD) = 37 (6.7). Male (n and %) = 11 (36 %).	31	Longitudinal	Polysomnography	Employment status, living arrangement and partnership status (the three variables were then merged into one single 'social functioning' sum score)	Multiple regression analysis showed slow-wave sleep (SWS) and number of hospitalizations as significant predictors accounting for 50 % of the variance in SOF (R^2 = .507; p < .001). The follow up mediation analysis showed that SWS had a significant positive direct effect on SOF (not mediated by number of hospitalizations) (b = .025; p > .005). However, sleep duration, sleep efficiency, other sleep stages, and REM latency did not have a significant predictive capacity (exact significance scores unavailable for all variables).	Partially NS (significant p > .005)	R^2 = .507

ASRS, Adult Social Relationships Scales; BSSD, Brief Screen for Sleep Disorders; CSD, Consensus Sleep Diary; CMF, Clinical Monitoring Form; ESS, Epworth Sleepiness Scale; HDRS, Hamilton Depression Rating Scale; FAST, Functioning Assessment Short Test; GAF, Global Assessment of Functioning; IDS-C, Inventory of Depressive Symptomatology, Clinician Rating; ISI, Insomnia Severity Index; LIFE-RIFT, Range of Impaired Functioning Tool; NHWS, Japan National Health and Wellness Survey; OSQ, Oviedo Sleep Questionnaire; PROMIS, The Patient-Reported Outcomes Measurement Information System; PSP, Personal and Social Performance Scale; PSQI, Pittsburgh Sleep Quality Index; SDS, Sheehan Disability Scale., SF-12v2, Short Form 12 item (version 2) Health Survey; SLOF, Specific Levels of Functioning Scale; SOFAS, Social and Occupational Functioning Assessment Scale; WHOQOL-BREF, World Health Organization Quality of Life Brief Version; UPSA, The UCSD Performance-Based Skills Assessment; WPAI, Work Productivity and Activity Impairment Questionnaire.

benefits attributed to *adequate* sleep included 'feeling more sociable', 'increased energy and motivation', and 'thinking more clearly'. Participants also described work and occupational goals, acknowledging that many of these were contingent on adequate amount and quality of sleep. This supports the quantitative relationships reported between sleep quality/duration and SOF.

3.4.2. Relationship between sleep duration and SOF

Three quantitative studies (Gruber et al., 2011; Gruber et al., 2009, and De la Fuente-Tomás et al., 2018) primarily focused on sleep duration in relation to SOF. They were all cross-sectional by design. Gruber et al. (2009) and Gruber et al. (2011) both used average total sleep time in the past week and sleep variability via the 'Clinical Monitoring Form' to measure sleep whilst De la Fuente-Tomás et al. (2018) used the Oviedo Sleep Questionnaire (OSQ). All three included the GAF in their measurement of SOF. All three focused on participants with BD.

Gruber et al. (2011) found no lasting significant relationship between total sleep time or sleep variability with SOF. However, this conflicted with De la Fuente-Tomás et al. (2018) which found a significant negative association between long sleep duration and SOF, and the much higher-powered Gruber et al. (2009) study which found a significant negative association between long *and* short sleep duration and SOF.

3.4.3. Relationship between sleep disorders and SOF

Seven studies primarily assessed disturbance or specific disorders (i.e., insomnia) in association with SOF, all but one of which were cross-sectional by design, the other again utilising descriptive and interpretative analysis in their qualitative approach. Four studies focused specifically on schizophrenia or psychosis diagnoses, one focused specifically on BD, and two reported on participants with both schizophrenia and BD. Sleep assessment tools varied across the studies. Most of the studies assessed for presence of insomnia or non-specific sleep disturbance, whilst Matsui et al. (2021) focused on Circadian Rhythm Sleep-Wake Disorder specifically. The GAF was used to measure SOF in four of the seven studies.

Baba et al. (2022), Blanchard et al. (2020), and Giglio et al. (2009) were the three studies within this category to examine the influence of sleep disorder/disturbance on *multiple aspects* of functioning (e.g., more than just the GAF). Baba et al. (2022) measured social and occupational functioning individually using two different measures, as well as recording scores for absenteeism, presenteeism, work productivity impairment, and total activity impairment, finding significant associations between sleep disturbance and every individual measure of SOF. Similarly, Giglio et al. (2009) found that presence of insomnia was significantly associated with worse SOF scores on not only the GAF but all three sub-scales (work, social, and familial) of the SDS. Blanchard et al. (2020) found sleep disturbance was significantly positively associated with SOF across four measures including sub-domains of: relationships, work skills, personal care, physical functioning, planning ability, house management, and perceived loneliness/hostility/rejection.

Studies that assessed insomnia/non-specific sleep disturbance all found a significant positive association between sleep and SOF overall. However, Matsui et al. (2021) only found trends toward lower GAF scores in the Circadian Rhythm Sleep-Wake Disorder (CRSWD) group (n. = 19) compared to the non-CRSWD group (n. = 86), which did not reach statistical significance following a false discovery rate correction.

Batalla-Martín et al. (2022) conducted semi-structured interviews with 31 schizophrenia patients with insomnia. Participants described several consequences of insomnia that relate to SOF including 'feeling down with no energy', 'feeling nervous and anxious', 'restlessness', 'a lack of motivation', 'difficulties concentrating and in performance', 'memory problems', 'bad moods', 'difficulty getting up', 'irritability', and 'apathy', supporting the relationship between insomnia and SOF in patients with schizophrenia.

3.4.4. Relationship between objectively recorded sleep variables and SOF

Two studies (Bradley et al., 2017 and Drews et al., 2018) used solely objective means of assessing and measuring sleep. Bradley et al. (2017) found that accelerometer-determined sleep disturbances (including circadian rhythm disturbance and moderately severe obstructive sleep apnoea) were significantly positively associated with SOF (as measured by the FAST self-report questionnaire). Drews et al. (2018) conducted a longitudinal (6-year) study on 31 patients with either schizophrenia or major depression to investigate the relevance of polysomnographic sleep parameters for social functioning as measured by employment status, living arrangement and partnership status. This comprised the only study to use polysomnography in this review. Multiple regression analysis showed slow-wave sleep (SWS) and number of hospitalizations as significant predictors accounting for 50 % of the variance in SOF. The follow up mediation analysis showed that SWS had a significant positive *direct* effect on SOF (not mediated by number of hospitalizations). However, no other sleep variables (including sleep duration, sleep efficiency, other sleep stages, and REM latency) significantly predicted SOF.

Mulligan et al. (2016) and Chung et al. (2018) used a combination of subjective and objective means to assess sleep. Mulligan et al. (2016) examined the role of sleep disturbance (measured via actigraphy and self-report measures) in predicting SOF day-to-day in 22 patients with schizophrenia. They found that objective and subjective sleep efficiency, subjective sleep quality, and objective and subjective total sleep time predicted improved next-day functioning, whilst objective sleep fragmentation predicted worse next-day functioning. Chung et al. (2018) used actigraphy and sleep diaries to explore correlates of sleep irregularity (i.e., variations in sleep onset, offset, and mid-point) in 66 patients with schizophrenia. Sleep irregularity was not found to be significantly associated with SOF in this study, though it was significantly positively associated with 'social rhythm irregularity', which comprises an element of social functioning.

4. Discussion

The aim of this systematic review was to explore the link between sleep and SOF within an SMI population. Nearly all studies in this review supported that sleep is related to SOF. The majority of studies reported on self-reported sleep quality/satisfaction or duration, but the few studies that utilized objective or combined objective-subjective measures support and give weight to the notion that sleep is a highly relevant feature in understanding reduced SOF within SMI groups. The included qualitative studies also add depth and richness to this relationship, and support that the effect of sleep on SOF is meaningful to patients. This consistency in findings is especially notable given the huge variations in how sleep and SOF were measured, and the range of SMI diagnoses included across studies. The studies collated in this review collectively support that sleep is a relevant target for further research in understanding SOF in SMI and support the potential role of improved sleep as a route to improved SOF in these groups.

When considering *how* sleep affects SOF the studies reported in this review provide limited detail, since many of them report on sleep problems in terms of a single overall score, rather than looking at specific parameters. Nevertheless, some plausible mechanisms were indicated, though these varied across studies. For example, Walz et al. (2013) and Fekih et al. (2021) found a significant association between *sleepiness* and SOF whilst Gruber et al. (2009) found a significant association between sleep *duration* and SOF. Mulligan et al. (2016) found that sleep *efficiency, quality, duration,* and *fragmentation* were associated with SOF. In contrast to these direct associations, Samalin et al. (2017) reported that the relationship between sleep and SOF in their sample was mediated by depressive symptoms and cognitive performance – e.g., poor sleep leads to reduced mood/cognitive performance, and this contributes to reduced SOF. Finally, the only polysomnographic study (Drews et al., 2018) found that slow-wave sleep (SWS) was the *only* sleep parameter to significantly predict long-term social functioning in their

sample. This is plausible since SWS is already known to be key for reducing somnolence and improving memory and cognitive functioning (Stepan et al., 2021; Walker, 2009; Knowles et al., 1986) and is also reduced in SMI generally (Kaskie et al., 2019; Chan et al., 2017). Whilst multiple mechanisms are suggested here, it is clear they require further testing in appropriate designs to better understand their impact on SOF.

It is worth noting that four studies (Blanchard et al., 2020; Fekih et al., 2021; Lai et al,. 2014, and Laskemoen et al., 2019) compared sleep problems in SMI to sleep problems in healthy control groups (rather than SMI groups without sleep problems) and these all demonstrated statistically significant results. Whilst it could be hypothesized that differences would be larger when comparing sleep problems in SMI groups to non-SMI groups, it is difficult to make inferences about whether differences were greater between these studies due to the disparity in measures used.

Many of the studies included in this review categorized sleep in terms of a specific disorder (i.e., insomnia, circadian rhythm disorder, obstructive sleep apnoea) which can be clinically useful to inform treatment. Other studies based their evaluation of sleep on symptomatology alone, without clarifying whether the sleep problem could be classified as a comorbid diagnosis or was a symptom of the SMI (e.g., short sleep duration in manic phase of BD). It might be argued that without diagnosis, the primary SMI alone should be the focus of treatment with the view that this would simultaneously resolve sleep problems. This is an interesting area of debate, with recent literature suggesting that regardless of whether sleep problems are comorbid with another diagnosis, they should form an independent treatment target (Freeman et al., 2020), an argument that is upheld by the most recent update of the DSM-5 (American Psychiatric Association, 2013). This is because sleep and mental health share a bidirectional relationship, each playing a part in maintaining the other's severity. We would echo this stance in light of this review demonstrating that addressing sleep problems could alleviate (and prevent from recurring) difficulty in functioning, a key feature of SMI diagnoses.

4.1. Clinical implications

The findings of this review point to a likelihood of sleep problems impacting negatively on SOF in SMI groups, and so highlight various clinical implications. Firstly, since improving sleep is likely to lead to improved SOF in these groups (whether directly or indirectly), it seems justifiable to implement efficient routine assessment of sleep for SMI patients to enable clinicians to gauge how potentially problematic it is in each case. Unfortunately, sleep difficulties tend not to be routinely recorded or monitored, instead often viewed as secondary symptoms of other mental health difficulties, meaning they do not receive the treatment they warrant (Freeman et al., 2020). Secondly, this review provides further support for following existing NICE-recommended treatment for patients (including SMI) affected by insomnia, such as offering sleep hygiene advice and CBT-I, whilst simultaneously ensuring comorbidities are optimally managed (National Institute for Health and Care Excellence, 2022). Based on this review, if improved SOF was deemed a relevant goal for an SMI patient, incorporating sleep intervention into treatment as usual could be especially useful. Alleviating sleep problems in this way has already been shown to improve the symptoms of comorbid primary mental health problems (Scott et al., 2021b), but is also likely to create an 'upward cycle' of beneficial outcomes in SMI groups. A third implication of this review is the potential benefit of providing sleep hygiene information alongside treatment as usual for *all* patients with SMI, if only as a preventative measure, given their inherent vulnerability to sleep problems in the first instance.

4.2. Strengths and limitations

Only nine studies reported effect sizes for the associations examined between sleep and SOF, many of which were not standardized, limiting our ability to interpret the effect sizes in any meaningful way between studies. Lack of any effect size in the remaining studies further limits what can be inferred from the findings.

Most of the studies included in this review relied solely on subjective sleep measures. These have benefits and disadvantages. They have sometimes been shown to clash with results of more objective sleep measures (Chung et al., 2020). For example, Faulkner and Bee (2017) noted that participants obtaining relatively low scores on the PSQI often described severe problems in interview. They also cannot measure certain sleep parameters with the precision that polysomnography, the 'gold standard' for assessing sleep, can. More subjective approaches can, however, provide an understanding of how people *perceive* their sleep, and so provide a unique and invaluable insight in that sense.

As with sleep measures, there were also limitations with the subjective SOF measures featured in this review. Clinician-rated measures such as the GAF, PSP, and SOFAS were the most commonly used measures of SOF. The main limitation of the GAF and SOFAS is their lack of sensitivity to dysfunction within specific subdomains (Searle et al., 2022); collating functioning into a single global score makes it harder to detect small changes in specific domains (Harvey, 2013). The PSP uses more formally operationalized scores in four discrete domains of social and occupational functioning and is therefore somewhat more reliable. On this note, SOF is a broad concept and inevitably overlaps with quality of life (QoL). Whilst most of the SOF measures included in this study aimed to measure functioning only, there are some which include QoL questions (i.e., EQ-5D). In these cases, we could not always meaningfully exclude responses in relation to QoL from responses relating to functioning, however by including these papers we were able to obtain a broader overview of the association between sleep and SOF.

There is no universally agreed definition of SMI, rendering it a difficult group to report on consistently in research. However, the term 'SMI' is used widely in literature because these groups generally represent a large share of clinical time and cost in most mental health systems, and will usually be seen in the same or parallel settings (secondary and inpatient). Therefore, it is reasonable to group them together, especially when reporting on transdiagnostic concerns such as sleep, or common impacts such as lower socio-occupational functioning.

This study focused exclusively on participants with an existing diagnosis of SMI, a group that experiences challenges which inherently tend to inhibit SOF. For instance, only 10–20 % of people with psychosis return to competitive employment, despite 61% expressing a desire to work (Mueser et al. 2001). However, this only serves to further highlight the importance of addressing deficits in SOF and the factors contributing to them, particularly those that are potentially modifiable, such as sleep. The consistency and broadness of sleep impacting across the important recovery domains of SOF substantiates the importance of this paper.

4.3. Directions for future research

One valuable topic for future research is whether and which sleep parameters (i.e., slow-wave sleep, REM sleep) are most associated with SOF. Another interesting avenue is what *types* of sleep disorder (i.e., insomnia, hypersomnia) feature most commonly in SMI populations and which factors (i.e., trauma, medication) mediate this, as this could affect how sleep, and indirectly, SOF, are treated. It would be beneficial to see more consistency in measures across studies and more RCTs, since no relevant RCTs were retained after scoping the literature. Ideally, future studies will include both objective (such as actigraphy or polysomnography for sleep) *and* reliable subjective measures (such as PSQI or ISI for sleep and PSP or a performance-based assessment for SOF).

Another aspect of sleep which would be interesting to explore further based on the findings in this review is long sleep duration (10+ hours of sleep per night). Only three studies looked at long sleep duration despite it being well known to have deleterious effects on functioning (Lallukka et al., 2018; van Oostrom et al., 2018). The largest study found that long and short sleep duration were indeed significantly associated with

reduced SOF, consistent with evidence from Dauvilliers and Buguet (2005) and Gooneratne et al. (2003). Long sleep duration in SMI is likely due to a bidirectional relationship between lack of quality sleep and predisposing factors (such as environment, comorbid conditions, and medication effects), but overall has not been given much research attention (Reeve, 2021). There are multiple ways in which long sleep duration could specifically impact SOF. For example, oversleeping could affect ability to work and attend social engagements . Low daily activity could also maintain low mood, and so further exacerbate a decline in SOF (Ekers et al., 2014).

4.4. Conclusion

Although caution should be taken in generalising the findings due to varying and/or absent effect sizes, the studies included in this review collectively support that sleep may help to explain reduced SOF in SMI groups since they collectively point toward sleep problems being positively associated with SOF problems. This review supports clinical consideration of sleep as a factor in supporting people with SMI to protect, develop, or restore their SOF, which is an important treatment target. Further research is warranted considering how common sleep problems are in this population and the potential harm they could have on functioning.

CRediT authorship contribution statement

Aviva Stafford: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Sheri Oduola:** Writing – review & editing, Supervision, Methodology. **Sarah Reeve:** Writing – review & editing, Supervision, Project administration, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

Search strategy

PubMed and PsychNet were searched in February 2023. The search strategy used across all databases was as follows:

(“Severe mental illness” OR “serious mental illness” OR “Schizophrenia” OR “Schizoaffective disorder” OR “Schizotypal disorder” OR “Psychotic” OR “psychotic disorde” OR “Delusional disorder” OR “Psychosis” OR “Bipolar” OR “Cyclothym*” OR “Sever* depress*” OR “Persistent depress*” OR “Dysthymia” OR “Severe eating disorder” OR “Severe personality disorder”)*

AND

(“activity leve” OR “quality of life” OR “HRQoL” OR “The Personal Social Performance” OR “Adult Social Relationships Scales" OR “Specific Levels of Functioning Scale” OR “UCSD Performance-Based Skills Assessment” OR “UPSA-B” OR “Work Productivity and Activity Impairment Questionnaire” OR “WPAI” OR “Work and Social Adjustment Scale” OR “International Physical Activity Questionnaire” OR “IPAQ” OR “Sheehan Disability Scale” OR “social occupational functio*” OR “social functio*” OR “occupational functio*” OR “functioning” OR “work productivity” OR “Time Use Survey” OR “Social and Occupational Functioning Assessment Scale” OR “Occupational Functioning Scale” OR “Social functioning questionnaire” OR “Social functioning schedule” OR “Social functioning scale” OR “Social Adjustment Scale Self-Report” OR “SAS-SR” OR “Social Adjustment Scale” OR “The Structured and Scaled Interview to Assess Maladjustment” OR “SSIAM” OR “Social Behaviour Assessment Schedule” OR “Interview Schedule for Social Interaction” OR “Katz Adjustment Scale” OR “EQ-5D” OR “Health of the Nation Outcome Scales” OR “HoNOS” OR “Assessment of Occupational Functioning” OR “Global Assessment of Functioning” OR “Functioning Assessment Short Test” OR “Range of Impaired Functioning Tool” OR “Longitudinal Interval Follow-up Evaluation” OR “LIFE-RIFT” OR “Personal and Social Performance scale” OR “Specific Level of Functioning Scale” OR “psychological wellbeing”)*

AND

(“sleep” OR “insomnia” OR “nightmare” OR “IDS-C” OR “Inventory of Depressive Sympto” OR “Pittsburgh Sleep Quality Index Global Scale” OR “PSQI” OR “insomnia severity index” OR “DISP” OR “Diagnostic Interview for Sleep Patterns and Disorders” OR “SLEEP-50” OR “Oviedo Sleep Questionnaire” OR “polysomnography” OR “actigraphy” OR “Epworth Sleepiness Scale”)*

NOT

(“dementia” OR “parkinso*”)

References

Afonso, P., Brissos, S., Bobes, J., Canas, F., Fernandez, I.B., 2015. Personal and social functioning and satisfaction with life in schizophrenia outpatients with and without sleep disturbances. Rev. Port. Psiquiatr. Esaudem. 1 (1), 33–40. Accessed via. https://core.ac.uk/reader/288057800.

Akers, N., Lobban, F., Hilton, C., Panagaki, K., Jones, S.H., 2019. Measuring social and occupational functioning of people with bipolar disorder: a systematic review. Clin. Psychol. Rev. 74 https://doi.org/10.1016/j.cpr.2019.101782. N.PAG.

American Psychological Association. (2024). APA PsycNet. https://www.apa.org/pubs/databases/psycnet.

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders, 5th ed. American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425596.

Baba, K., Guo, W., Chen, Y., Nosaka, T., Kato, T., 2022. Burden of Schizophrenia among Japanese patients: a cross-sectional National Health and Wellness Survey. BMC Psychiatry 22 (1), 1–14. https://doi.org/10.1186/s12888-022-04044-5.

Batalla-Martín, D., Martorell-Poveda, M-A., Belzunegui-Eraso, A., Garijo, E.M., Del-Cuerpo Serratosa, A., Pérez, J.V., Escobar, M.M., Lopez-Ruiz, M, 2022. The experience of insomnia in patients with schizophrenic disorder: a qualitative study. Front. Psychiatry 12. https://doi.org/10.3389/fpsyt.2021.805601.

Bellido-Zanin, G., Ángeles Pérez-San-Gregorio, M., Martín-Rodríguez, A., Vázquez-Morejón, A.J., 2015. Social functioning as a predictor of the use of mental health resources in patients with severe mental disorder. Psychiatry Res. 230 (2), 189–193. https://doi.org/10.1016/j.psychres.2015.08.037.

Ben Simon, E., Walker, M.P., 2018. Sleep loss causes social withdrawal and loneliness. Nat. Commun. 9 (1), 3146. https://doi.org/10.1038/s41467-018-05377-0.

Benson, K.L., 2015. Sleep in schizophrenia: pathology and treatment. Sleep Med. Clin. 10 (1), 49–55. https://doi.org/10.1016/j.jsmc.2014.11.001.

Blanchard, J.J., Savage, C.L.G., Orth, R.D., Jacome, A.M., Bennett, M.E., 2020. Sleep problems and social impairment in psychosis: a transdiagnostic study examining multiple social domains. Front. Psychiatry 11, 1–9. https://doi.org/10.3389/fpsyt.2020.00486.

Bradley, A.J., Webb-Mitchell, R., Hazu, A., Slater, N., Middleton, B., Gallagher, P., McAllister-Williams, H., Anderson, K.N., 2017. Sleep and circadian rhythm disturbance in bipolar disorder. Psychol. Med. 47 (9), 1678–1689. https://doi.org/10.1017/S0033291717000186.

Buysse, D.J., Reynolds III, C.F., Monk, T.H., Berman, S.R., Kupfer, D.J, 1989. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. Psychiatry Res. 28 (2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4.

Chan, M.-S., Chung, K.-F., Yung, K.-P., Yeung, W.-F., 2017. Sleep in schizophrenia: a systematic review and meta-analysis of polysomnographic findings in case-control studies. Sleep Med. Rev. 32, 69–84. https://doi.org/10.1016/j.smrv.2016.03.001.

Chung, K.-F., Poon, Y.P.Y.-P., Ng, T.-K., Kan, C.-K., 2018. Correlates of sleep irregularity in schizophrenia. Psychiatry Res. 270, 705–714. https://doi.org/10.1016/j.psychres.2018.10.064.

Chung, K.-F., Poon, Y.P.Y.-P., Ng, T.-K., Kan, C.-K., 2020. Subjective-objective sleep discrepancy in schizophrenia. Behav. Sleep Med. 18 (5), 653–667. https://doi.org/10.1080/15402002.2019.1656077.

Dauvilliers, Y., Buguet, A., 2005. Hypersomnia. Dialogues Clin. Neurosci. 7 (4), 347–356.

Davies, G., Haddock, G., Yung, A.R., Mulligan, L.D., Kyle, S.D., 2017. A systematic review of the nature and correlates of sleep disturbance in early psychosis. Sleep Med. Rev. 31, 25–38. https://doi.org/10.1016/j.smrv.2016.01.001.

De la Fuente-Tomás, L., Sierra, P., Sanchez-Autet, M., García-Blanco, A., Safont, G., Arranz, B., García-Portilla, M.P., 2018. Sleep disturbances, functioning, and quality of life in euthymic patients with bipolar disorder. Psychiatry Res. 269, 501–507. https://doi.org/10.1016/j.psychres.2018.08.104.

Douglas, C, Wood, L, Taggart, D., 2022. Recovery priorities of people with psychosis in acute mental health in-patient settings: a Q-methodology study. Behav. Cogn. Psychother. 50 (1), 1–14. https://doi.org/10.1017/S1352465820000892.

Drews, H.J., Wiesner, C.D., Bethke-Jaenicke, C., Weinhold, S.L., Baier, P.C., Göder, R., 2018. Slow-wave sleep predicts long-term social functioning in severe mental illness. PLoS ONE 13 (8), 1–16. https://doi.org/10.1371/journal.pone.0202198.

Ekers, D., Webster, L., Van Straten, A., Cuijpers, P., Richards, D., Gilbody, S., 2014. Behavioural activation for depression; an update of meta-analysis of effectiveness and sub group analysis. PLoS ONE 9 (6), 1–11. https://doi.org/10.1371/journal.pone.0100100.

Faulkner, S., Bee, P., 2017. Experiences, perspectives and priorities of people with schizophrenia spectrum disorders regarding sleep disturbance and its treatment: a qualitative study. BMC Psychiatry 17, 1–17. https://doi.org/10.1186/s12888-017-1329-8.

Fekih, R.F., Nefzi, H., Sassi, H., Cherif, W., Cheour, M., 2021. Sleep in first-episode schizophrenia patients, their unaffected siblings and healthy controls: a comparison. Early Interv. Psychiatry 15 (5), 1167–1178. https://doi.org/10.1111/eip.13058.

Freeman, D., Sheaves, B., Waite, F., Harvey, A.G., Harrison, P.J., 2020. Sleep disturbance and psychiatric disorders. Lancet Psychiatry 7 (7), 628–637. https://doi.org/10.1016/S2215-0366(20)30136-X.

Freeman, D., Waite, F., Startup, H., Myers, E., Lister, R., McInerney, J., Harvey, A.G., Geddes, J., Zaiwalla, Z., Luengo-Fernandez, R., Foster, R., Clifton, L., Yu, L.-M., 2015. Efficacy of cognitive behavioural therapy for sleep improvement in patients with persistent delusions and hallucinations (BEST): a prospective, assessor-blind, randomised controlled pilot trial. The Lancet Psychiatry 2 (11), 975–983. doi:10.1016/S2215-0366(15)00314-4.

Furlan, A.D., Pennick, V., Bombardier, C., Van Tulder, M., 2009. 2009 updated method guidelines for systematic reviews in the cochrane back review group. Spine (03622436) 34 (18), 1929–1941. https://doi.org/10.1097/BRS.0b013e3181b1c99f.

Gabrielian, S., Hamilton, A.B., Gelberg, L., Koosis, E.R., Johnson, A., Young, A.S., 2019. Identifying social skills that support housing attainment and retention among homeless persons with serious mental illness. Psychiatr. Serv. 70 (5), 374–380. https://doi.org/10.1176/appi.ps.201800508.

Giglio, L., Andersen, M., Ceresér, K., Kapczinski, F., 2009. Sleep in bipolar patients. Sleep Breath. 13 (2), 169–173. https://doi.org/10.1007/s11325-008-0215-5.

Gooneratne, N.S., Weaver, T.E., Cater, J.R., Pack, F.M., Arner, H.M., Greenberg, A.S., Pack, A.I., 2003. Functional outcomes of excessive daytime sleepiness in older adults. J.- Am. Geriatr. Soc. 51 (5), 642–649.

Grande, I., Berk, M., Birmaher, B., Vieta, E., 2016. Bipolar disorder. Lancet 387 (10027), 1561–1572. https://doi.org/10.1016/S0140-6736(15)00241-X.

Gruber, J., Harvey, A.G., Wang, P.W., Brooks, J.O., Thase, M.E., Sachs, G.S., Ketter, T.A., 2009. Sleep functioning in relation to mood, function, and quality of life at entry to the systematic treatment enhancement program for bipolar disorder (STEP-BD). J. Affect. Disord. 114 (1–3), 41–49. https://doi.org/10.1016/j.jad.2008.06.028.

Gruber, J., Miklowitz, D.J., Harvey, A.G., Frank, E., Kupfer, D., Thase, M.E., Sachs, G.S., Ketter, T.A., 2011. Sleep matters: sleep functioning and course of illness in bipolar disorder. J. Affect. Disord. 134 (1–3), 416–420. https://doi.org/10.1016/j.jad.2011.05.016.

Harvey, P.D., 2013. Assessment of everyday functioning in schizophrenia: implications for treatments aimed at negative symptoms. Schizophr. Res. 150 (2–3), 353–355. https://doi.org/10.1016/j.schres.2013.04.022.

Hong, Q.N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.-P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.-C., Vedel, I., Pluye, P., 2018. The mixed methods appraisal tool (MMAT) version 2018 for information professionals and researchers. Educ. Inf. 34 (4), 285–291.

Kanady, J.C., Soehner, A.M., Klein, A.B., Harvey, A.G., 2017. The association between insomnia-related sleep disruptions and cognitive dysfunction during the inter-episode phase of bipolar disorder. J. Psychiatr. Res. 88, 80–88. https://doi.org/10.1016/j.jpsychires.2017.01.001.

Kaskie, R.E., Gill, K.M., Ferrarelli, F., 2019. Reduced frontal slow wave density during sleep in first-episode psychosis. Schizophr. Res. 206, 318–324. https://doi.org/10.1016/j.schres.2018.10.024.

Knowles, J.B., MacLean, A.W., Salem, L., Vetere, C., Coulter, M., 1986. Slow-wave sleep in daytime and nocturnal sleep: an estimate of the time course of "Process S.". J. Biol. Rhythms 1 (4), 303–308. https://doi.org/10.1177/074873048600100404.

Kucharczyk, E.R., Morgan, K., Hall, A.P., 2012. The occupational impact of sleep quality and insomnia symptoms. Sleep Med. Rev. 16 (6), 547–559. https://doi.org/10.1016/j.smrv.2012.01.005.

Kuehner, C., Huffziger, S., 2009. Subjective quality of life aspects predict depressive symptoms over time: results from a three-wave longitudinal study. Acta Psychiatr. Scand. 120 (6), 496–499. https://doi.org/10.1111/j.1600-0447.2009.01436.x.

Lai, Y.-C., Huang, M.-C., Chen, H.-C., Lu, M.-K., Chiu, Y.-H., Shen, W.W., Lu, R.-B., Kuo, P.-H., 2014. Familiality and clinical outcomes of sleep disturbances in major depressive and bipolar disorders. J. Psychosom. Res. 76 (1), 61–67. https://doi.org/10.1016/j.jpsychores.2013.10.020.

Lallukka, T., Sivertsen, B., Kronholm, E., Bin, Y.S., Øverland, S., Glozier, N., 2018. Association of sleep duration and sleep quality with the physical, social, and emotional functioning among Australian adults. Sleep Health: J. Natl. Sleep Found. 4 (2), 194–200. https://doi.org/10.1016/j.sleh.2017.11.006.

Laskemoen, J.F., Aas, M., Vaskinn, A., Berg, A.O., Lunding, S.H., Barrett, E.A., Melle, I., Simonsen, C., 2021. Sleep disturbance mediates the link between childhood trauma and clinical outcome in severe mental disorders. Psychol. Med. 51 (14), 2337–2346. https://doi.org/10.1017/S0033291720000914.

Laskemoen, J.F., Simonsen, C., Büchmann, C., Barrett, E.A., Bjella, T., Lagerberg, T.V., Vedal, T.J., Andreassen, O.A., Melle, I., Aas, M., 2019. Sleep disturbances in schizophrenia spectrum and bipolar disorders – a transdiagnostic perspective. Compr. Psychiatry 91 (6–12), 6–12. https://doi.org/10.1016/j.comppsych.2019.02.006.

Law, H., Morrison, A.P., 2014. Recovery in psychosis: a delphi study with experts by experience. Schizophr. Bull. 40 (6), 1347–1355. https://doi.org/10.1093/schbul/sbu047.

Long, M., Stansfeld, J.L., Davies, N., Crellin, N.E., Moncrieff, J., 2022. A systematic review of social functioning outcome measures in schizophrenia with a focus on suitability for intervention research. Schizophr. Res. 241, 275–291. https://doi.org/10.1016/j.schres.2022.02.011.

Lunsford-Avery, J.R., Kollins, S.H., Mittal, V.A., 2019. Eveningness diurnal preference associated with poorer socioemotional cognition and social functioning among healthy adolescents and young adults. Chronobiol. Int. 36 (3), 439–444. https://doi.org/10.1080/07420528.2018.1538156.

Matsui, K., Inada, K., Kuriyama, K., Yoshiike, T., Nagao, K., Oshibuchi, H., Akaho, R., Nishimura, K., Raduà, J., Geoffroy, P.A., 2021. Prevalence of circadian rhythm sleep-wake disorder in outpatients with schizophrenia and its association with psychopathological characteristics and psychosocial functioning. J. Clin. Med. 10 (7), 1513. https://doi.org/10.3390/jcm10071513.

Morgan, R.L., Whaley, P., Thayer, K.A., Schünemann, H.J., 2018. Identifying the PECO: a framework for formulating good questions to explore the association of environmental and other exposures with health outcomes. Environ. Int. 121, 1027–1031. https://doi.org/10.1016/j.envint.2018.07.015.

Morosini, P.-L., Brambilla, L., Ugolini, S., Pioli, R., Magliano, L., 2000. Development, reliability and acceptability of a new version of the DSM- IV social occupational functioning assessment scale (SOFAS) to assess routine social functioning. Acta

Psychiatr. Scand. 101 (4), 323–329. https://doi.org/10.1034/j.1600-0447.2000.101004323.x. –329.
Mueser, K.T., Salyers, M.P., Mueser, P.R., 2001. A prospective analysis of work in schizophrenia. Schizophr. Bull. 27 (2), 281–296. https://doi.org/10.1093/oxfordjournals.schbul.a006874.
Mulligan, L.D., Emsley, R., Haddock, G., Neil, S.T., Kyle, S.D., 2016. High resolution examination of the role of sleep disturbance in predicting functioning and psychotic symptoms in Schizophrenia: a novel experience sampling study. J. Abnorm. Psychol. 125 (6), 788–797. https://doi.org/10.1037/abn0000180.
National Institute for Health and Care Excellence (2022). Insomnia: Management. https://cks.nice.org.uk/topics/insomnia/management/.
National Institutes of Health. (2024). PubMed. https://pubmed.ncbi.nlm.nih.gov/.
Ong, W.J., Tan, X.W., Shahwan, S., Satghare, P., Cetty, L., Ng, B.T., Tang, C., Verma, S., Chong, S.A., Subramaniam, M., 2020. Association between sleep quality and domains of quality of life amongst patients with first episode psychosis. Health Q. Life Outcomes 18 (1), 1–9. https://doi.org/10.1186/s12955-020-01367-3.
Peck, M.C., Scheffier, R.M., 2002. An analysis of the definitions of mental illness used in state parity laws. Psychiatr. Serv. 53 (9), 1089–1095. https://doi.org/10.1176/appi.ps.53.9.1089.
Piersma, H.L., Boes, J.L., 1997. The GAF and psychiatric outcome: a descriptive report. Commun. Ment. Health J. 33 (1), 35–41.
Reeve, S., Sheaves, B., Freeman, D., 2021. Excessive sleepiness in patients with psychosis: an initial investigation. PLoS One 16 (1), 1–12. https://doi.org/10.1371/journal.pone.0245301.
Ritsner, M., Kurs, R., Ponizovsky, A., Hadjez, J., 2004. Perceived quality of life in Schizophrenia: relationships to sleep quality. Q. Life Res. 13 (4), 783–791. https://doi.org/10.1023/B:QURE.0000021687.18783.d6.
Russo, M., Mahon, K., Shanahan, M., Ramjas, E., Solon, C., Purcell, S.M., Burdick, K.E., 2015. The relationship between sleep quality and neurocognition in bipolar disorder. J. Affect. Disord. 187, 156–162. https://doi.org/10.1016/j.jad.2015.08.009.
Samalin, L., Boyer, L., Murru, A., Pacchiarotti, I., Reinares, M., Bonnin, C.M., Torrent, C., Verdolini, N., Pancheri, C., de Chazeron, I., Boucekine, M., Geoffroy, P.-A., Bellivier, F., Llorca, P.-M., Vieta, E., 2017. Residual depressive symptoms, sleep disturbance and perceived cognitive impairment as determinants of functioning in patients with bipolar disorder. J. Affect. Disord. 210, 280–286. https://doi.org/10.1016/j.jad.2016.12.054.
Saraswat, N., Rao, K., Subbakrishna, D.K., Gangadhar, B.N., 2006. The social occupational functioning scale (SOFS): a brief measure of functional status in persons with schizophrenia. Schizophr. Res. 81 (2), 301–309. https://doi.org/10.1016/j.schres.2005.09.008.
Scott, A.J., Webb, T.L., Martyn-St James, M., Rowse, G., Weich, S, 2021b. Improving sleep quality leads to better mental health: a meta-analysis of randomised controlled trials. Sleep Med. Rev. 60 https://doi.org/10.1016/j.smrv.2021.101556.
Scott, J., Kallestad, H., Vedaa, O., Sivertsen, B., Etain, B., 2021a. Sleep disturbances and first onset of major mental disorders in adolescence and early adulthood: a systematic review and meta-analysis. Sleep Med. Rev. 57, 101429 https://doi.org/10.1016/j.smrv.2021.101429.
Searle, A., Allen, L., Lowther, M., Cotter, J., Barnett, J.H., 2022. Measuring functional outcomes in schizophrenia in an increasingly digital world. Schizophr. Res.: Cognit. 29 https://doi.org/10.1016/j.scog.2022.100248.
Si, T.M., Zhang, Y.l., Feng, Y., Zhuo, J.M., Cai, S., Zhang, L, 2019. Association between symptom control and functional improvement in patients with acute schizophrenia: a post hoc analysis of an open-label, single-arm, multi-center study of paliperidone-extended release formulation. Psychiatry Res. 274, 301–305. https://doi.org/10.1016/j.psychres.2019.02.036.
Somaiya, M., Grover, S., Avasthi, A., Chakrabarti, S., 2014. Changes in cost of treating Schizophrenia: comparison of two studies done a decade apart. Psychiatry Res. 215 (3), 547–553. https://doi.org/10.1016/j.psychres.2014.01.013.
Stepan, M.E., Altmann, E.M., Fenn, K.M., 2021. Slow-wave sleep during a brief nap is related to reduced cognitive deficits during sleep deprivation. Sleep 44 (11). https://doi.org/10.1093/sleep/zsab152.
Sylvia, L.G., Dupuy, J.M., Ostacher, M.J., Cowperthwait, C.M., Hay, A.C., Sachs, G.S., Nierenberg, A.A., Perlis, R.H., 2012. Sleep disturbance in euthymic bipolar patients. J. Psychopharmacol. 26 (8), 1108–1112. https://doi.org/10.1177/0269881111421973.
Tempesta, D., Socci, V., De Gennaro, L., Ferrara, M., 2018. Sleep and emotional processing. Sleep Med. Rev. 40, 183–195. https://doi.org/10.1016/j.smrv.2017.12.005.
Troxel, W.M., Robles, T.F., Hall, M., Buysse, D.J., 2007. Marital quality and the marital bed: examining the covariation between relationship quality and sleep. Sleep Med. Rev. 11 (5), 389–404. https://doi.org/10.1016/j.smrv.2007.05.002.
van Oostrom, S.H., Nooyens, A.C.J., Verschuren, W.M.M., van Boxtel, M.P.J., 2018. Long sleep duration is associated with lower cognitive function among middle-age adults – the Doetinchem cohort study. Sleep Med. 41, 78–85. https://doi.org/10.1016/j.sleep.2017.07.029.
Varese, F., Smeets, F., Drukker, M., Lieverse, R., Lataster, T., Viechtbauer, W., Read, J., van Os, J., Bentall, R.P., 2012. Childhood adversities increase the risk of psychosis: a meta-analysis of patient-control, prospective- and cross-sectional cohort studies. Schizophr Bull. 38 (4), 661–671. https://doi.org/10.1093/schbul/sbs050.
Vauth, R., Carpiniello, B., Turczyński, J., Ivanov, M., Cherubin, P., Lahaye, M., Schreiner, A., 2021. Relationship between clinical outcomes measures and personal and social performance functioning in a prospective, interventional study in schizophrenia. Int. J. Methods Psychiatr. Res. 30 (2), 1–11. https://doi.org/10.1002/mpr.1855.
Waghorn, G., Lloyd, C., 2005. The employment of people with mental illness. Austr. E-J. Adv. Ment. Health 4 (2), 1–43. https://doi.org/10.5172/jamh.4.2.129.
Walker, M.P., 2009. The role of slow wave sleep in memory processing. J. Clin. Sleep Med. 5 (2), S20–S26. https://doi.org/10.5664/jcsm.5.2s.s20.
Walz, J.C., Magalhães, P.V., Reckziegel, R., Costanzi, M., Giglio, L., Kapczinski, F., 2013. Daytime sleepiness, sleep disturbance and functioning impairment in bipolar disorder. Acta Neuropsychiatr. 25 (2), 101–104. https://doi.org/10.1111/j.1601-5215.2012.00673.x.
Wang, W.-L., Zhou, Y.-Q., Chai, N.-N., Li, G.-H., 2020. Sleep disturbance and quality of life in clinically stable inpatients with schizophrenia in rural China. Q. Life Res. 29 (10), 2759–2768. https://doi.org/10.1007/s11136-020-02541-2.
World Health Organization, 1993. The ICD-10 Classification of Mental and Behavioural Disorders. World Health Organization.