Research Square

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Hypersomnia in psychosis: testing relationships with clinical features, psychiatric symptoms, and wellbeing

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Abstract

Background

Hypersomnia, including excessive daytime sleepiness and prolonged sleep duration, is commonly reported in psychosis but is often conceptualised primarily as a sedating side effect of antipsychotic medication. Consequently, hypersomnia has received relatively limited research attention compared to insomnia, despite its potential relevance to psychiatric symptoms, functioning, and recovery. This study explored relationships between hypersomnia severity and demographic and clinical characteristics, psychiatric symptoms, sleep-related features, wellbeing, and physical activity in people with psychosis.

Methods

A cross-sectional survey was completed by 57 adults with psychosis recruited via NHS services and social media. Linear regressions examined associations between hypersomnia severity and i) demographic and clinical variables, including antipsychotic dosage, ii) sleep-related variables, iii) psychiatric symptoms, and iv) wellbeing and physical activity.

Results

Hypersomnia severity was not significantly associated with demographic characteristics, antipsychotic prescription, antipsychotic dosage, sleep duration, or physical activity. Hypersomnia severity was significantly associated with increased insomnia symptoms, daytime sleepiness, and fatigue. More severe hypersomnia was also associated with greater paranoia, hallucinations, depression, and anxiety symptoms. Increased hypersomnia severity was significantly associated with poorer quality of life.

Conclusions

The findings add to emerging evidence that hypersomnia in psychosis is not solely attributable to antipsychotic medication and may instead represent a clinically meaningful feature associated with broader symptom severity and reduced wellbeing. Hypersomnia merits additional focus as a potential marker of poor recovery. Longitudinal and objective studies are needed to clarify causal pathways and determine whether targeting hypersomnia may improve recovery outcomes in psychosis.

Introduction

Excessive daytime sleepiness and extended sleep duration i.e. hypersomnia are common issues for patients with psychosis [1,2]. Often this presentation is attributed to the sedating properties of antipsychotic medication (due to their interaction with histaminergic signalling [3,4], or may be ascribed to negative symptoms or co-occurring depression. This has led to relatively little attention on hypersomnia, limiting the ability of clinicians or researchers to understand specific impacts of hypersomnia or identify routes by which it might be improved.

There has been growing attention on sleep difficulties – particularly insomnia – in psychosis [5]. This has illustrated that sleep difficulties can be a maintaining factor for psychotic symptoms, and that improving sleep may lead to benefits in psychiatric symptomatology and wellbeing [6]. While this research has been focused on insomnia, throughout there has been acknowledgement that elements of hypersomnia are also common, with treatment protocols adapted accordingly [7,8]. Similarly in depression both hypersomnia and insomnia are common, with presence of either or both being linked to worsened clinical trajectory [9]. However, again, hypersomnia is relatively under-investigated despite being acknowledged as a secondary symptom of depression [10].

However, hypersomnia may have significant clinical relevance. There are several mechanisms by which hypersomnia may maintain symptoms or worsen patient outcomes. Qualitative research indicates that excessive sleep might sometimes function as a conscious coping method or 'escape' strategy for patients with psychosis [11–13] This could induce a vicious cycle, whereby extended sleep induces more sleep inertia, resulting in ongoing sleepiness [10,14]. Hypersomnia may also diminish motivation and energy levels, or negatively impact cognition, which further contribute to low mood or negative symptoms [15,16]. With respect to psychosis symptoms, increased sleep duration has been linked to more severe psychotic symptoms in one large-scale study [17].

Beyond psychiatric outcomes, hypersomnia is associated with reduced physical activity. People with psychosis on average spend around 3hrs more each day sedentary than the general population [18], and our previously mentioned exploratory study indicated a specific association between low daytime activity levels and sleepiness [19]. Sedentary activity has been associated with an elevated risk of cardiac or metabolic health issues, resulting in greater death rates among those who sleep for extended durations [20], This can be linked to the disparity in life expectancy for those with psychosis, which is approximately 15 years less than matched general population controls, mostly attributed to cardiovascular disease morbidity [21]. It is also likely that hypersomnia impacts on social recovery –including engagement with valued activities, employment, or other activities such as childcare [12,22]. Lastly excessive sleepiness may also directly hinder patients' ability to engage in treatment by stopping them from attending or actively participating in visits with mental health teams.

Research Questions

The current study aims to test associations between hypersomnia and i) demographic and clinical factors ii) sleep features and iii) psychiatric symptoms and iv) wellbeing, and physical activity to identify relevant factors for future research.

Methods

Design

The study was a cross-sectional survey design, recruiting from both social media and NHS secondary mental health services (Cambridgeshire and Peterborough NHS Foundation Trust; CPFT). Data were collected from April 2023 to December 2024.

Participants

Participants were required to be aged between 18-65, based in the UK, fluent in English, and have a diagnosis of a schizophrenia spectrum disorder (including first episode psychosis). Individuals with a primary affective disorder (e.g. depression), substance use disorder, or organic diagnoses were excluded, as were individuals with more than moderate or more severe learning disability based on lack of ability to make reasonable adjustments to the online survey to enable participation.

Potential participants were identified by advertising amongst local NHS teams (including community adult mental health teams and early intervention in psychosis services), and via social media advertisements. All participants provided informed consent to take part in the study, and had the opportunity to enter a prize draw for a shopping voucher to thank them for their participation.

Sixty-one individuals provided consent and completed the online survey, however four were excluded (n=3 for not confirming a diagnosis, n=1 for being based outside of UK), leaving n=57 participants in the final dataset.

Measures

All measures were self-reported by participants, with data collected via the JISC online survey system.

Demographic and Clinical Data

Participants self-reported their age, gender, ethnicity, highest level of education, and occupational status.

Participants were also requested to state their diagnosis, what team they were being treated under (if any), and to self-report their medication name and dosage. These were categorised by type (e.g. antidepressant, antipsychotic, hypnotic), with the antipsychotic medications being additionally converted to their dopaminergic daily dosage equivalents for analysis [23].

Sleep Related Questions

Hypersomnia was assessed using the Hypersomnia Severity Index (HSI [24]This is a concise tool designed to measure the severity of and functional impairment arising from hypersomnia symptoms, that was developed and specifically validated for use in patients with psychiatric disorders. The questionnaire consists of nine items, and the total score may range from 0 to 36. If the score is 10 or more, it may indicate the presence of hypersomnia over the preceding month. The HSI demonstrated a satisfactory level of internal consistency, with a coefficient of 0.82.

Participants were asked to estimate their typical sleep duration over the past month (hours per night). They were also asked how frequently they felt excessively sleepy to the extent that it was challenging to stay awake of engage in activities (number of days per week).

The Insomnia Severity Index (ISI; [25] is a self-report questionnaire consisting of seven items. It is used to assess the severity of insomnia symptoms experienced by an individual during the last month. The Likert scale used in

this study assigns a rating from 0 to 4 to each item, with 0 indicating no difficulty and 4 indicating a very severe issue. The total score, which ranges from 0 to 28, is derived from these ratings. The questionnaire has strong internal consistency, as shown by a Cronbach's α coefficient of 0.9.

The Epworth Sleepiness Scale (ESS; [26] is an eight-item self-report questionnaire designed to evaluate symptoms of excessive daytime sleepiness. Participants are requested to assess, using a 4-point scale ranging from 0 to 3, their typical likelihood of dozing off or falling asleep during eight distinct activities. The ESS score, calculated as the sum of the scores for the eight items, ranges from 0 to 24. It has satisfactory internal consistency (Cronback's α = 0.82).

The Fatigue Severity Scale (FSS; [27] is a questionnaire consisting of nine items that assesses the level of exhaustion experienced as a symptom in various chronic illnesses and conditions. The scale assesses the impact of fatigue on daily functioning by investigating its association with motivation, physical activity, employment, family, and social life. It also asks respondents to evaluate the ease with which they become tired and the extent to which this symptom hinders them. Responses are rated on a seven-point scale, with 1 indicating "strongly disagree" and 7 indicating "strongly agree." Thus, the minimum possible score is nine, and the maximum is 63. In the first psychometric analysis conducted by Krupp et al. (1989), the FSS demonstrated an internal consistency of 0.88.

Psychiatric Symptom Measures

The Depression, Anxiety, and Stress Scale - 21 Items (DASS-21;[28] is a questionnaire that provides three assessments of depression, anxiety, and stress by using a set of 21 questions that individuals answer about their own emotional state. For this current study, only the depression and anxiety subscales were utilised. Participants evaluate each of the seven things on a scale from 0 ("did not apply at all") to 3 ("applied very much"). Higher scores indicate increased levels of anxiety and depression. The three measures have shown exceptional internal consistency, with all Cronbach coefficients over 0.90.

The Specific Psychotic Experiences Questionnaire (SPEQ; [29]) is a set of questionnaires designed to assess six features of psychotic experiences: paranoia, hallucinations, cognitive disorganisation, grandiosity, anhedonia, and negative symptoms. This current research used only the hallucinations subscale. This subscale has nine items, each assessed on a uniform scale, leading to a total score of 45. All six subscales of the SPEQ showed exceptional internal consistency and stability over a period of nine months, with correlation coefficients ranging from .65 to .74 (all $P < .001$).

The revised Green et al. Paranoid Thoughts Scale (R-GPTS; [30]) by Freeman et al., 2019 is a tool used to quantify paranoia and comprises two 16-item measures that evaluate thoughts of reference (Part A) and concepts of persecution (Part B). The overall score for each subscale is calculated by summing the items. The R-GPTS has excellent reliability throughout the range of severity, offering an accurate evaluation of paranoia suitable for both non-clinical and clinical environments.

Wellbeing and physical activity measures

Recovering Quality of Life (ReQoL; [31] was developed to assess the quality of life of people with different mental health difficulties, with a specific emphasis on the rehabilitation process. All items are rated on a five-point Likert scale from "none of the time" to "most or all of the time." The total score is determined by adding together the scores of all items, except the physical health item. A higher score indicates a superior quality of life. The internal consistency, as measured by Cronbach's α, was found to be 0.96, indicating a high level of reliability (Keetharuth et al., 2018).

The SIMPAQ (Simple Physical Activity Questionnaire [32] is a short questionnaire consisting of five items for assessing physical activity and sedentary behaviour in individuals with mental illness. The 5-item tool assesses time spent in bed during the night, time spent inactive (including sleeping), time spent walking, time spent exercising, and time involved in incidental activity over the last week. The total hours entered in the five SIMPAQ boxes should total about 24 hours.

Analysis

The analyses were conducted using the statistical software Jamovi (2023). Demographic and clinical descriptive statistics were reported for all variables. The testing adopted a two-tailed approach with group-wise Bonferroni corrections applied for multiple testing.

RQ1: Is hypersomnia severity related to differences in demographic or clinical features?

This research question was addressed using linear regression (age, medication dosage or t-tests (gender, yes/no prescribed antipsychotic medication, white/non-white ethnicity, employed/unemployed) to assess if hypersomnia severity was related to any of the outcome variables. The adjusted p-value for this set of comparisons was p=0.008.

RQ2 Is hypersomnia severity related to sleep features?

A set of individual linear regressions were conducted to examine the relationship between hypersomnia severity and insomnia (ISI), fatigue (FSS), sleepiness (ESS and number of days feeling excessively sleepy), and self-reported sleep duration. The adjusted p-value for this set of comparisons was p=0.01.

RQ3 Is hypersomnia severity related to clinical symptoms?

A final set of individual linear regressions was conducted to explore the relationship between hypersomnia severity and paranoia (reference and persecution GPTS-R), hallucinations (SPEQ), depression (DASS), and anxiety (DASS). The adjusted p-value for this set of comparisons was 0.01.

RQ4 Is hypersomnia severity related to quality of life or physical activity?

Two independent linear regressions were conducted to assess the relationship between hypersomnia severity and quality of life (ReQoL) and physical activity (SIMPAQ).

Patient and Public Participation (PPI)

The psychosis lived experience group at CPFT provided input on the selection of measures and the study process. In addition to advising on recruitment material, the PPI team advised against collecting full sleep diaries – instead focusing on sleep duration – given the aims of the study and complexity of completing sleep diaries correctly without assistance. They also advised on selection of activity monitoring measure out of options available, and suggested this measure be made optional.

Ethical Approval

The study received ethical approval from the London Bloomsbury Research Ethics Committee (REC) - reference number 23/LO/0085. The University of East Anglia acted as the study sponsor. All procedures were performed in accordance with the ethical standards of the 2024 Declaration of Helsinki[33].

Alterations from original analysis plan

The original analysis plan for this study revolved around comparing the group (n=24) who met the criteria for hypersomnia disorder i.e. both long sleep duration (more than 11h in 24h, or more than 9h each night) and excessive daytime sleepiness (at least 3 days/week) to those who did not (n=33) out of the participant group. However, the rate of hypersomnia symptoms across whole sample was high, with 49 participants (86.0%) meeting one (but not both) of the long sleep duration or excessive daytime sleepiness criteria. This reduced the perceived validity of the 'non-hypersomnia' comparison group, and we therefore undertook a linear re-analysis of the data using hypersomnia severity as the primary predictor of interest.

Results

Participant demographics and descriptive statistics are reported in Table 1. There was a preponderance of females in the study sample (n=39, 68.4%). Ages of participants ranged from 19 to 62, with an average of 37.5. Around half the participants were either part-time or full-time employed (n=29, 50.9). The vast majority of participants were white (n=52, 92.2%). The majority had at least an undergraduate degree or equivalent qualification (64.9%, n=27). The majority of participants reported their diagnosis as 'psychosis' or 'first episode psychosis' (n=30, 52.6%). Most participants (n=39, 68.4%) were prescribed antipsychotic medication, with the most common prescribing being a combination of antipsychotics alongside either an anti-depressant or mood stabiliser.

The group as a reported extended average night-time sleep (8h05m, with range from 3hrs to 12hrs, compared to UK adult average of 6h59; Leng et al., 2014)), with twenty-four (n=42.1%) endorsing more than 11hrs sleep in a 24hr period (i.e. including naps). The group on average felt sleepy least 3 days a week (3.26, SD = 2.8), although 21 participants reported no days of sleepiness (36.8%). The HSI score average was above the clinical cut off (average = 17.2, n=47 or 82.5% above cut off >10). Similarly the clinical questionnaires support that the

participants had other clinically significant difficulties based on scores at or near clinical cut off for scales with reported norms including insomnia (average =13.6, clinical cut off >14), persecution (average = 15.7, clinical cut off >10), and quality of life (average 18.5, clinical cut off <20).

RQ1: Is hypersomnia severity related to differences in demographic or clinical features?

Hypersomnia severity was not significantly related to age (β=-0.21, SE = 0.2,t=-102, p=0.312). It also did not significantly differ between male (average = 19.4, SD = 5.6) and female (mean = 16.2, SD = 7.2) respondents (t=-1,67, df = 55, p = 0.1). Hypersomnia was also not significantly related (t=-0.85 (df=48), p=0.399) to employed status (average =18.6, SD=6.2) compared to unemployed status (average = 17.0, SD=7.6).

Hypersomnia was also not significantly related (t=0.502 (df=55), p=0.618) to diagnosis of schizophrenia (mean = 17.6, SD=7.1) versus psychosis or first episode psychosis (mean = 16.7, SD = 6.7). Hypersomnia also did not differ between those prescribed antipsychotic medication (mean =17.2, SD=6.9), and those not prescribed antipsychotic medication (mean =17.5, SD=7.1; t=0.119 df=54, p=0.906). It also did not significantly differ by either defined daily dose (estimate = 0.623, SE=1.6, t=0.39, p=0.697) or chlorpromazine equivalent (estimate <0.001, SE <0.001, t=0.023, p=0.98).

Overall, no clinical or demographic features were related to hypersomnia severity.

RQ2 Is hypersomnia severity related to sleep features?

Table 2 contains the results of this set of analyses. As would be expected, sleepiness measures (Epworth sleepiness scale and days excessively sleepy) were significantly related to hypersomnia severity, but also there were significant relationships between hypersomnia, insomnia, and fatigue. No relationship was indicated between hypersomnia severity and estimated sleep duration.

Table 1. Demographic and clinical descriptives for the study sample

	N (%) or Mean (SD)
Gender-n (%)	
Male	18 (31.5)
Female	39 (68.4)
Age-average years (SD)	37.5 (10.4)
Occupational status-n (%)	
Unemployed	21 (36.8)
Employed	29 (50.9)
Homemaker/Student/Retired	7 (12.3)
Ethnicity-n (%)	
Any White background	52 (91.2)
Black or Asian background	5 (8.8)
Level of education completed n (%)	
Primary education	2 (3.6)
Secondary education	18 (31.5)
Tertiary education	27 (64.9)
Diagnosis-n%	
Schizophrenia	16 (28.1)
SZA/SPD/DD [a]	11 (19.3)
Psychosis – not otherwise specified (including FEP) [b]	30 (52.6)
Medications prescribed n (%)	
Antipsychotics only	15 (33.3)
Other medication only[c]	5 (11.1)
Antipsychotics and other medication	24 (53.3)
No medication prescribed	1(2.2)
No response	12 (21.0)
Antipsychotic dosage–mean (SD)[d]	
Defined Daily Dose (DDD)	1.24 (0.7)
Chlorpromazine equivalent (CPZ)	438 (351)
Sleep and mental health variables	

Hours of sleep/night	8.04 (2.1)
How many days per week feeling excessively sleepy	3.26 (2.8)
Hypersomnia (HSI) - *predictor*	17.20 (6.9)
Sleepiness (ESS)	8.98 (5.4)
Insomnia (ISI)	13.6 (5.3)
Fatigue (FSS)	39.40 (13.6)
Paranoia - reference (R-GPTS)	13.70 (9.8)
Paranoia – persecution (R-GPTS)	15.70 (11.8)
Hallucinations (SPEQ-H)	17.5 (13.1)
Depression (DASS)	12.3 (5.3)
Anxiety (DASS)	8.82 (4.8)
Quality of Life (ReQol)	18.5 (6.6)
Physical Activity (SIMPAQ)	0.88 (1.8)

[a] Schizoaffective/schizotypal/delusional disorder

[b] Psychotic disorders not otherwise specified (including first episode psychosis)

[c] Includes antidepressants, anxiolytics, mood stabilisers, hypnotics

[d] Statistics only include participants prescribed antipsychotic medication i.e. n=39

Table 2: Relationships between hypersomnia and sleep-related features

			95% Confidence Interval					95% Confidence Interval	
	Estimate	**SE**	**Lower**	**Upper**	**t**	**p**	**Std. estimate**	**Lower**	**Upper**
Insomnia (ISI)	0.479	0.083	0.313	0.644	5.80	<.001*	0.616	0.403	0.829
Sleepiness (ESS)	0.474	0.085	0.303	0.644	5.57	<.001*	0.600	0.384	0.816
Days excessive sleepy	0.212	0.123	0.313	0.048	4.40	<.001*	1.240	1.130	1.370
Fatigue (FSS)	1.090	0.223	0.647	1.540	4.91	<.001*	0.552	0.326	0.777
Sleep duration (hrs)	-0.017	0.042	-0.101	0.066	-0.42	0.674	-0.057	-0.327	0.213

Adjusted significance threshold = 0.01

Table 3: Relationships between hypersomnia and clinical symptoms

			95% Confidence Interval					95% Confidence Interval	
	Estimate	**SE**	**Lower**	**Upper**	**t**	**p**	**Std. estimate**	**Lower**	**Upper**
Paranoia – reference (GPTS-R)	0.483	0.181	0.120	0.846	2.67	0.010*	0.338	0.084	0.593
Paranoia – persecution (GPTS-R)	0.505	0.222	0.058	0.951	2.27	0.027	0.293	0.034	0.551
Hallucinations (SPEQ)	0.725	0.239	0.246	1.200	3.03	0.004*	0.379	0.128	0.629
Depression (DASS)	0.306	0.095	0.115	0.497	3.22	0.002*	0.398	0.150	0.646
Anxiety (DASS)	0.237	0.089	0.058	0.416	2.65	0.010*	0.337	0.0823	0.591

*n=28

Adjusted significance threshold = 0.01

RQ3 Is hypersomnia severity related to clinical symptoms?

Table 3 contains full results for this analysis. Hypersomnia severity was associated more severe paranoia – particularly ideas of reference rather than ideas of persecution (the latter did not meet adjusted significance levels). Hypersomnia was associated with significantly more severe hallucinations. Hypersomnia was also associated with more severe depression and anxiety. All associations were of similar magnitude based on standardised estimates.

RQ4 Is hypersomnia severity related to quality of life or physical activity?

Hypersomnia severity was significantly related to lower reported quality of life amongst respondents (β=-0.321, SE = 0.122,t=-2.64, p=0.011). No significant differences in physical activity levels were detected (β=-0.145, SE = 0.103 ,t=1.40, p=0.265), although given this questionnaire was optional there was a smaller respondent pool (n=28).

Discussion

This study aimed to identify relevant factors in relation to hypersomnia in psychosis, in relation to clinical and demographic features, sleep features, clinical symptoms, and general functioning. The results include some unexpected findings – including that no relationship was identified between hypersomnia and any clinical or demographic features (including medication dosage), sleep duration, or physical activity levels. On the other hand, multiple relevant significant links with hypersomnia were identified across other sleep features (including insomnia severity and fatigue), worsened clinical symptoms, and reduced quality of life. The results indicate that hypersomnia may be associated with poor recovery in patients with psychosis. While no causal inferences can be made from this study, the results support testing interventions to improve, for example, depression or sleep quality to investigate effect on hypersomnia, or vice versa. In either case this would be worthwhile to investigate given the relevance of these factors to patient recovery in psychosis.

The lack of relationship between medication variables and hypersomnia has been reported in other studies [35], including our previous secondary analysis [19] but is nevertheless contrary to expectations given that hypersomnia symptoms are typically assumed to arise from sedative side effects of antipsychotic medication. One potential explanation for a lack of detected relationship could be the focus on indices of dopaminergic effect for antipsychotic comparison, due to no relevant conversion for histaminergic interaction [3]. However, no relationship was identified even when comparing individuals prescribed antipsychotic medication to those who were not, and there were no indications of trends in the data supporting any relationship between medication variables and hypersomnia severity. This indicates that further research is needed on the relationship between sedation, sleepiness, medication dosages, and psychological factors [4].

Conversely, a strong relationship was reported between hypersomnia and more severe clinical symptoms, particularly depression and anxiety – and to a lesser extent paranoia and hallucinations. With respect to depression and anxiety this replicates previously indicated effects in our exploratory study [19], and aligns with the known relationship between hypersomnia and depression [36]. Hypersomnia may contribute to depression through reduced activity levels, diminished exposure to rewarding experiences, social withdrawal, and disruption to daily structure, while depression itself may increase tendencies towards prolonged sleep or time spent in bed [10,37]. Such reciprocal relationships may create self-perpetuating cycles that maintain both depressive symptoms and hypersomnia over time. An association with anxiety is less intuitive but was also indicated in our prior study [19]. Excessive sleepiness may additionally increase anticipatory anxiety around functioning demands, such as attending appointments, employment, or social activities, particularly where individuals fear embarrassment, exhaustion, or inability to cope [12]. Over time this may contribute to a reinforcing cycle in which anxiety promotes withdrawal and hypersomnia, which in turn further reduces confidence and engagement in valued activities.

A relationship between hypersomnia and psychosis symptoms, such as paranoia and hallucinations was not previously reported (in the prior exploratory study the indication was that higher levels of sleepiness were associated with reduced paranoia and hallucinations, although the effects did not reach significance). With respect to paranoia this could be understood within a framework of sleepiness again reducing daytime activity, facilitating avoidance of experiential learning of safety, and increased time in bed leading to increased rumination and worry [38]. For hallucinations it may be the case that hypersomnia affects people's ability to use helpful strategies to manage or affects their feeling of vulnerability to voices – both have been identified as

relevant factors in qualitative work [12,39]. Sleep could also being used as a coping mechanism – i.e. as an escape route – or alternatively contributing to sleep problems at night which lead to daytime sleepiness. These possibilities require future investigation.

There was no relationship identified between hypersomnia and physical activity, contrary to expectations given that sedation and sleepiness have been previous identified as linked to reduced physical activity in psychosis [18,40]. In our prior secondary analysis objective activity counts (via actigraphy) indicated less activity in patients meeting hypersomnia criteria versus those not meeting hypersomnia criteria [19], which diverges from the self-reported measure in the current study. Recent work on physical activity in psychosis has identified specific cognitions around seeking rest and being unaware of time passing that may be worth further exploration in addressing hypersomnia and physical activity, or understanding how these issues relate [41,42]. Another interesting null finding was the lack of relationship between hypersomnia and sleep duration. This could be due to generally high sleep duration across the study group (itself likely a reflection of response bias from survey advertising). Another possibility is that individuals with more severe hypersomnia may have been spending more time in bed but not sleeping – which is a common presentation for hypersomnia in depression [43,44]. As already indicated, objective monitoring of sleep and activity (e.g. with actigraphy) may assist with better understanding the relationship between hypersomnia, sleep, and activity.

Limitations and future research directions

One limitation of our current study is that we significantly altered our analysis from our original stated analysis plan (which involved group comparisons as per our previous exploratory work). We have attempted to address this by transparently addressing the changes in our analysis approach, correcting for multiple comparisons within domains, and including standardised coefficients.

Another important consideration is the difficulty of defining and operationalising hypersomnia within psychiatric populations. Hypersomnia is a heterogeneous construct encompassing excessive daytime sleepiness, prolonged sleep duration, sleep inertia, fatigue, and increased time spent in bed, which may not necessarily co-occur [45]. Existing diagnostic frameworks and measurement tools may not fully capture the complexity of hypersomnia presentations within psychosis. For example, some individuals may primarily experience subjective sleepiness despite normal sleep duration, whereas others may experience prolonged time in bed associated with depression, sedation, or low activity levels. Greater conceptual clarity regarding the different dimensions of hypersomnia may therefore improve both assessment and intervention development in psychosis populations.

General limitations of our study include its cross-sectional design, reliance on subjective measures (especially problematic for sleep and physical activity levels), reliance on self-report (e.g. about medication type and dosage), response bias induced by survey method (i.e. that individuals with hypersomnia were more likely to respond to the advertisement), and under-recruitment versus our original power calculation. It would also be worthwhile to investigate the relationship between hypersomnia and circadian rhythm disturbances in psychosis such as disrupted melatonin secretion, irregular sleep-wake timing, and reduced synchronisation with environmental cues [7,46] . Larger-scale, longitudinal, and objective studies are needed to better understand both the causal relationships and precise nature of the relationships identified in this study. Interventional studies may also be considered – for example, examining whether focused behavioural interventions for hypersomnia

result in enhancements in psychiatric symptoms and general well-being [47]. It would also be relevant to explore how hypersomnia symptoms change in light of other interventions – e.g. CBT for psychosis, social recovery therapy, medication changes, or the wide range of other interventions applied in psychosis contexts. If hypersomnia has a dynamic causal relationship with e.g. activity, wellbeing, depression, and psychotic symptoms it may provide alternative routes for intervention or support for patients in their recovery.

Conclusions

The current findings may have implications for routine clinical assessment and formulation within psychosis services. Excessive sleepiness is frequently normalised as an inevitable consequence of medication or severe mental illness and may therefore receive relatively limited assessment during routine reviews. However, the current results suggest hypersomnia may be associated with broader symptom severity and poorer quality of life irrespective of medication dosage. Increased assessment of hypersomnia within psychosis services may help highlight overlooked difficulties that impact engagement, functioning, and recovery.

Declarations

Ethics approval and consent to participate

The study received ethical approval from the London Bloomsbury Research Ethics Committee (REC) - reference number 23/LO/0085. The University of East Anglia acted as the study sponsor. All participants provided informed consent.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and analysed during the current study are not publicly available due individual privacy and the conditions of our ethical approval, but are available from the corresponding author on reasonable request.

Declaration of competing interests

The authors declare that they have no competing interests

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Authors' contributions

IM contributed to design of the study, led on its conduct and data collection, and contributed to data analysis. JH supervised the study and provided input into design, conduct, and analysis plan. SR conceptualised the study, supervised the study, and contributed to data analysis. All authors contributed to the drafting of the manuscript, and have read and approved the final version.

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