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Characteristics of people with bipolar disorder I with and without auditory verbal hallucinations

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Abstract

Background Approximately half of people with bipolar disorder type I (BD-I) report the presence of psychotic symptoms at least at some point during their illness. Previous data suggest that more than 20% of people with BD-I report the presence of auditory verbal hallucinations (AVHs), or “voice-hearing” in particular. While work in other disorders with psychotic features (e.g., schizophrenia) indicates that the presence vs. absence of AVHs is associated with poorer clinical outcomes, little is known about their effects on clinical and socioeconomic features in BD-I.

Methods We investigated whether people with BD-I ($N = 119$) with AVHs ($n = 36$) and without AVHs ($n = 83$) in their lifetime differ in terms of demographic features and clinical measures. Relations with AVHs and other positive symptoms were explored.

Results People with BD-I and AVHs vs. without AVHs had higher manic and positive symptom scores (i.e., higher scores on the hallucinations, delusions, and bizarre behavior subscales). Further, a greater proportion of those with vs. without AVHs reported lower subjective socioeconomic status and tended to have higher rates of unemployment, thus, speaking to the longer-term consequences of AVH presence.

Conclusion Our findings suggest that people with BD-I with AVHs exhibit more severe psychotic features and manic symptoms compared to those without. This might be associated with more socioeconomic hardship. More in-depth characterization of people with BD-I with/without AVHs is needed to fully understand this subgroup’s unique challenges and needs.

Limitations The modest sample size of the AVH group and a study population with low racial diversity/representation may limit generalizability.

Keywords Bipolar disorder, Auditory verbal hallucinations, Psychotic features, Sample characteristics

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Background

Bipolar disorder type I (BD-I) is a debilitating mood disorder characterized by episodes of mania (i.e., periods of abnormally elevated and irritable mood) and depression. However, psychotic symptoms, such as hallucinations and delusions, can also occur in BD-I, with at least one lifetime occurrence being reported in up to 57–70% of people with BD-I (Aminoff et al. 2022; Upthegrove et al. 2015). Studies have shown that a history of psychotic symptoms in BD-I is associated with increased cognitive and functional impairment, as well as a greater number of hospitalizations (Glahn et al. 2007; Levy et al. 2013; Simonsen et al. 2011; Strakowski et al. 2000).

Though generally understudied in the context of BD, previous work indicates that approximately 20% of people with BD-I report experiencing auditory verbal hallucinations (AVH), one of the most common types of hallucinations, at least once during their illness course (Morgan et al. 2005; Toh et al. 2015). AVHs can occur in any state of BD-I, but have been found to be more present during manic and mixed-manic episodes (Smith et al. 2017). Work in other disorders with psychotic features, such as schizophrenia, indicates that AVHs are associated with poorer clinical outcomes, as well as greater cognitive and functional impairments (Hugdahl et al. 2013; Jenkins et al. 2018; Kelleher et al. 2013; Toh et al. 2015). Studies in people with schizophrenia have also reported that AVHs correlated with increased severity of other hallucination types; this might contribute to functional impairment (Eve Lewandowski et al. 2009; Mueser et al. 1990). AVHs in people with BD-I have been associated with reduced illness insight; that is, decreased awareness of symptoms, openness to feedback about illness, and self-reflectiveness (Baethge et al., 2005; Kumari et al. 2013). Decreased insight has been linked with medication non-adherence, reduced cognitive performance, and daily and occupational functioning impairments (Sajatovic et al. 2011; Wels et al. 2023). Conversely, increased illness insight has been linked with better coping and adaptation in BD-I patients (Tohumcu and Çuhadar 2024). Compared to people with schizophrenia, the impact of AVHs in the context of BD-I in terms of sociodemographic features and clinical profiles has been unexplored. Such insight might be important in laying the groundwork for more tailored and ultimately more effective treatment approaches for distinct subgroups of people with BD-I.

This study aimed to assess whether BD-I patients with vs. without a history of AVH differ in terms of demographic (i.e., age, assigned sex at birth, race, ethnicity) and clinical features (e.g., depressive, manic, and positive symptoms). Most novel, we also assessed occupational and daily functioning, operationalized by years of education, subjective socioeconomic status (SES), employment/disability/student status, and housing situation

to assess the influence of AVH presence in people with BD. We expected that patients with AVHs would exhibit more pronounced indications of functional impairments, such as increased unemployment and disability status, and lower levels of education and subjective SES. We also explored if AVH severity was related to the severity of other hallucination types in people with BD-I and AVHs. Though this has been studied in schizophrenia, positive symptoms do not present the same way in BD-I (Baethge et al., 2005; Mancuso et al. 2015), as such, exploring such relations in people with BD-I addresses this research gap.

Methods

Participants

A total of $N=119$ people with BD-I, aged 18–68 years (39.3, $S.D.=13.5$), were recruited as part of the Bipolar Disorder Research Program of Excellence at the University of Iowa; participants were either outpatients affiliated with the University Health Centre or recruited from the community. To ensure eligibility and confirm diagnosis, research personnel administered the Structured Clinical Interview for DSM-5 (SCID-5) (First et al. 2015), followed by an unstructured clinical interview by a psychiatrist. The majority (64.7%; $N=77$) were female sex assigned at birth. Participants were divided into two groups based on the first item of the Scale for the Assessment of Positive Symptoms (SAPS) (Andreasen 1984): those who experienced AVH in their lifetime (BP/AVH+, SAPS score ≥ 1 ; $N=36$) and those who did not (BP/AVH-, SAPS score = 0; $N=83$). Group (i.e., BP/AVH+ vs. BP/AVH-) features are presented in Table 1.

Measures

The SAPS is a 34-item scale that measures positive psychotic symptoms (Andreasen 1984). It is divided into 4 subscales measuring hallucinations (items 1–6), delusions (8–19), bizarre behavior (21–24), and positive formal thought disorder (26–33). Each item is rated from 0 (absent) to 5 (severe). There are also global items (self-reported overall ratings for each subscale), but these were not included in the total/composite SAPS score or any subscale totals. Reliability tests showed excellent internal consistency of the overall SAPS scale (Cronbach's $\alpha=0.91$) in our sample ($N=119$).

The Montgomery Åsberg Depression Rating Scale (MADRS) is a 10-item scale that measures the presence of depression symptoms in the last week (Davidson et al. 1986). Each item is rated from 0 (none) to 6 (severe). Reliability tests showed good internal consistency (Cronbach's $\alpha=0.83$) in our sample ($N=119$).

The Young Mania Rating Scale (YMRS) is an 11-item scale that measures the presence of manic symptoms in the past 48 h (Young et al. 1978). Items 1–5, 7, 10, 11 are rated from 0 (none) to 4 (severe), while items 6, 8, 9

Table 1 Demographic factors and clinical scores for people with bipolar disorder type I (BD-I) with (BP/AVH+) and without (BP/AVH-) auditory verbal hallucinations (AVH)

Parameter	BP/AVH+ (N = 36)	BP/AVH- (N = 83)	Significance (N = 119)
Age (Years)	M = 40.6 (SD = 13.5)	M = 38.8 (SD = 13.9)	t(1,117) = 0.66 p = 0.51
Total Years of Education	M = 14.5 (SD = 2.0)	M = 15.0 (SD = 2.2)	t(1,117) = -1.23 1-tailed p = 0.11
Subjective SES	M = 4.8 (SD = 2.0)	M = 5.4 (1.9)	t(1,116) = -1.58 1-tailed p = 0.05*
Assigned Sex at Birth	Female = 21 (58.4%) Male = 15 (41.6%)	Female = 56 (67.5%) Male = 27 (32.5%)	$\chi^2 = 0.92$ p = 0.34
Race	Native American = 0 (0%) Asian = 0 (0%) Black/African American = 2 (5.6%) Multiracial = 1 (2.7%) White = 33 (91.7%)	Native American = 2 (2.4%) Asian = 2 (2.4%) Black/African American = 4 (4.8%) Multiracial = 2 (2.4%) White = 73 (88.0%)	$\chi^2 = 1.81$ p = 0.77
Ethnicity	Hispanic/Latino = 3 (8.3%) Other Ethnicity = 31 (86.1%) Unknown = 2 (5.6%)	Hispanic/Latino = 8 (9.6%) Other Ethnicity = 75 (90.4%) Unknown = 0 (0%)	$\chi^2 = 4.71$ p = 0.09
Housing Situation	Homeless/shelter = 1 (2.8%) Living with family = 5 (13.9%) House owner = 14 (38.9%) Renting = 16 (44.4%)	Homeless/shelter = 1 (1.2%) Living with family = 15 (18.1%) House owner = 28 (33.7%) Renting = 39 (47.0%)	$\chi^2 = 0.85$ p = 0.84
Disability Status	Disability = 10 (27.8%) Without disability = 26 (72.2%)	Disability = 17 (20.5%) Without disability = 66 (79.5%)	$\chi^2 = 0.76$ p = 0.26 (1-sided)
Employment Status	Employed (full/part time) = 17 (47.2%) Unemployed = 19 (52.8%)	Employed (full/part time) = 53 (63.9%) Unemployed = 30 (36.1%)	$\chi^2 = 2.87$ p = 0.068 (1-sided)
Student Status (full/part time)	Student = 4 (11.1%) Not in school = 32 (88.9%)	Student = 13 (15.7%) Not in school = 70 (84.3%)	$\chi^2 = 0.43$ p = 0.37 (1-sided)
SAPS total	M = 25.3 (SD = 16.0)	M = 5.2 (SD = 6.2)	F(1,117) = 98.28 p < 0.001**
MADRS total	M = 14.8 (SD = 7.9)	M = 14.0 (SD = 9.7)	F(1,117) = 0.16 p = 0.69
YMRS total	M = 10.1 (SD = 8.6)	M = 5.2 (SD = 5.5)	F(1,117) = 13.78 p < 0.001**
% time (past decade): Depressed	M = 38.8 (SD = 22.9)	M = 38.4 (SD = 26.2)	Z = -0.20 p = 0.84
% time (past decade): Manic	M = 23.0 (SD = 16.9)	M = 16.8 (SD = 16.0)	Z = -2.13 p = 0.03*
% time (past decade): Euthymic	M = 38.2 (SD = 26.7)	M = 44.9 (SD = 29.8)	Z = -1.01 p = 0.31

*p ≤ 0.05, **p < 0.001. Note. SES: Socioeconomic Status; SAPS: Scale for the Assessment of Positive Symptoms; MADRS: Montgomery Åsberg Depression Rating Scale; YMRS: Young Mania Rating Scale

are rated 0 (none) to 8 (severe). Reliability tests showed acceptable internal consistency (Cronbach’s alpha = 0.78) in our sample (N = 119).

Subjective SES was obtained using a “ladder rung” item that asked participants to select where they believe they rank socioeconomically (Adler and Stewart 2007). The bottom rung corresponds to a score of 1 (lowest SES), while the highest rung corresponds to a score of 10 (highest SES).

Retrospective symptom burden for each participant was estimated by percentage of time (self-reported) spent in depressed, manic, and euthymic mood states over the past decade (maximum 100%).

Statistics

Statistical analyses were performed using SPSS for Mac v. 28.0 (SPSS, Chicago, Illinois, USA); significance levels were p = 0.05, unless stated otherwise. A two-tailed student t-test was run to compare groups (i.e., BP/AVH+ vs. BP/AVH-) on age. One-sided t-tests were applied for total years of education and subjective SES as the AVH group was expected to report lower levels. Two-sided Pearson Chi Square statistics were used to compare groups on housing (homeless/shelter, living with family, owns a house, or renting an apartment/dormitory), assigned sex at birth, race, and ethnicity. To further explore our directional hypothesis (AVH group would exhibit more functional impairments), a Fisher’s exact

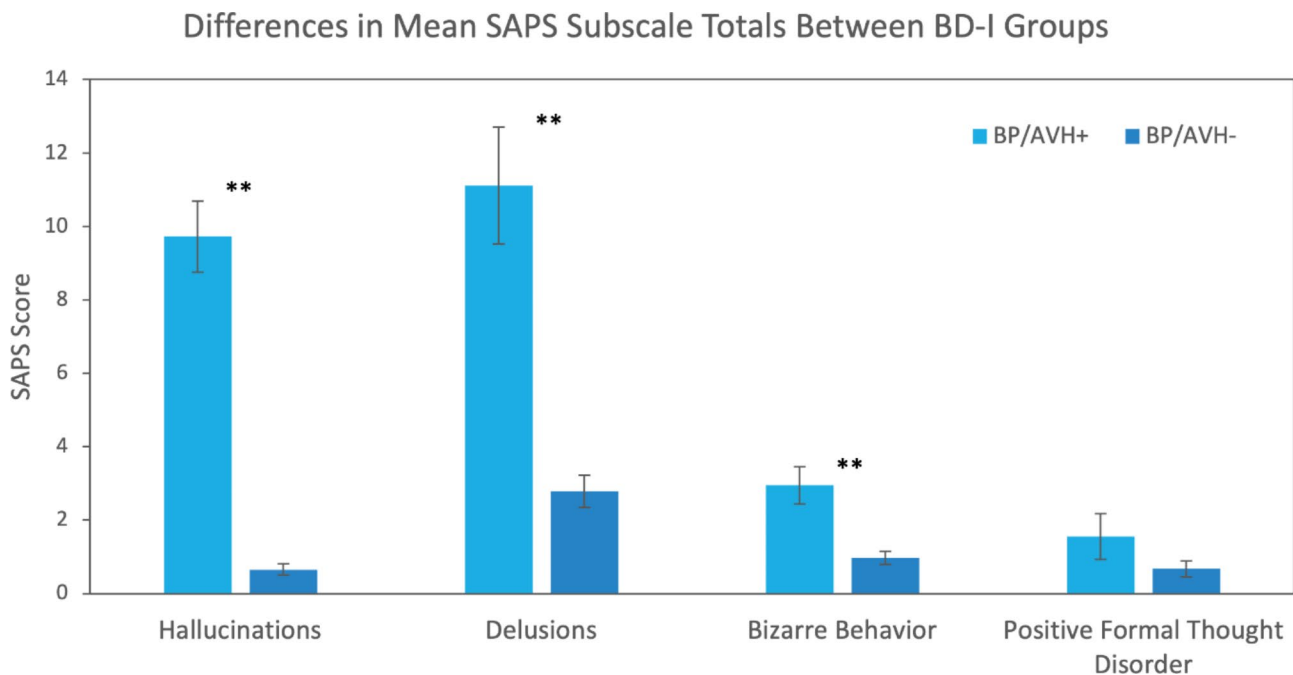


Fig. 1 Differences Between People with Bipolar Disorder Type I (BD-I) with (BP/AVH+) and without (BP/AVH-) Auditory Verbal Hallucinations (AVH) on the Scale for the Assessment of Positive Symptoms (SAPS) Subscales: Hallucinations, Delusions, Bizarre Behavior, and Positive Formal Thought Disorder. ** $p < 0.001$

test (one-sided) was used to compare groups on disability status (persons with or without disabilities), employment (full/part time employment or unemployed), and student status (enrolled in school or not).

Separate one-way analyses of variance (ANOVAs) were used to compare groups on SAPS, MADRS, and YMRS total scores. A multivariate ANOVA (MANOVA) was also used to compare groups on the four SAPS subscales. For the AVH group, exploratory Pearson’s correlations (with bias-corrected and accelerated bootstrapping) were performed to examine relations between the SAPS AVH item and each of the following SAPS items: tactile/somatosensory hallucinations, visual, and olfactory hallucinations. Finally, Mann-Whitney U tests were performed to compare the two groups on the self-reported and retrospectively estimated percentage of time spent in depressed, manic, and euthymic mood states over the past decade.

Results

Demographics

Table 1 displays the means for various demographic factors in the BP/AVH+ and BP/AVH- groups. The groups did not differ in terms of age ($t(1,117)=0.66, p=0.51$), assigned sex at birth ($\chi^2=0.92, p=0.34$), race ($\chi^2=1.81, p=0.77$), ethnicity ($\chi^2=4.71, p=0.09$), or housing situation ($\chi^2=0.85, p=0.84$). The AVH group tended to have fewer years of education than the group without AVHs ($t(1,117)=-1.35, p=0.09$). The BP/AVH+ group

had a lower subjective SES ($t(1,116)=-1.58, p=0.05$) and a greater tendency for being unemployed ($\chi^2=2.87, p=0.068$) compared to the BP/AVH- group. Fisher’s exact tests revealed that the AVH group was not more likely to declare disability status ($\chi^2=0.76, p=0.26$) or be out of school ($\chi^2=0.43, p=0.37$) compared to the group without AVHs; the inclusion of total SAPS scores (minus hallucinatory item score) as a covariate on these outcomes is presented in Supplementary Table 1.

Clinical measures

In terms of clinical scales (Table 1), SAPS ($F(1,117)=98.28, p<0.001, \text{partial}\eta^2=0.46$) and YMRS ($F(1,117)=13.78, p<0.001, \text{partial}\eta^2=0.11$) total scores were elevated in the BP/AVH+ vs. BP/AVH- group. However, AVH presence was not found to influence MADRS total scores ($F(1,117)=0.16, p=0.69, \text{partial}\eta^2=0.001$; see Supplementary Table 1 for the effect of including total SAPS score [minus hallucinatory item] as a covariate).

A MANOVA for the four SAPS subscales (hallucinations, delusions, bizarre behavior, positive formal thought disorder) was conducted between the groups; the multivariate model was significant (Pillai’s Trace=0.61, $F(4,114)=47.97, p<0.001, \text{partial}\eta^2=0.63$). Follow-up univariate analyses yielded a difference between groups on hallucinations ($F(1,117)=192.44, p<0.001, \text{partial}\eta^2=0.62$), delusions ($F(1,117)=43.92, p<0.001, \text{partial}\eta^2=0.27$), and bizarre behavior ($F(1,117)=17.64, p<0.001, \text{partial}\eta^2=0.13$) subscales (Fig. 1). No group difference

existed on the positive formal thought disorder subscale ($F(1,117) = 2.10, p = 0.15, \text{partial}\eta^2 = 0.02$).

Finally, the BP/AVH+ group ($M = 23.0\%$) reported significantly more time spent in manic episodes over the past decade compared to the BP/AVH- group ($M = 16.8\%$) ($Z = -2.13, p = 0.03$). These differences were not evident for depressed ($Z = -0.20, p = 0.84$) or euthymic ($Z = -1.01, p = 0.31$) states.

Exploratory correlations

For the BP/AVH+ group, there was no significant correlations found between the SAPS AVH and tactile hallucination items ($r = 0.004, p = 0.63, 95\% \text{BCa CI } [-0.40, 0.35]$). This was also the case for the correlation between the AVH and the olfactory hallucination ($r = 0.07, p = 0.67, 95\% \text{BCa CI } [-0.26, 0.39]$) and visual hallucination items ($r = 0.18, p = 0.28, 95\% \text{BCa CI } [-0.15, 0.48]$).

Discussion

This study aimed to compare demographic and clinical characteristics between BD-I people with vs. without AVHs. We expected that the AVH group would exhibit more functional impairments in terms of socioeconomic (e.g., unemployment, disability status) and clinical features. In addition, we sought to examine the relations between the SAPS AVH item and other types of hallucinations for the BP/AVH+ group as this has previously been under-explored and would provide some insight into the relations between hallucinatory features.

Our BP/AVH+ sample made up 30.3% ($n = 36$) of the entire cohort ($N = 119$), which is consistent (though somewhat higher) with past literature that found the proportion of people with BD-I and AVHs was around 20% (Morgan et al. 2005; Toh et al. 2015). While we found that the groups did not differ on most demographic factors, people with BD-I and AVHs reported lower subjective SES and a tendency for lower employment rates compared to those without AVHs. The AVH group also had elevated positive (delusions, bizarre behavior, other kinds of hallucinations) and manic symptoms; no differences in depressive symptoms existed. In addition, the AVH group had higher YMRS scores and retrospectively reported significantly more time spent in manic states over the past decade compared to the non-AVH group. Finally, no correlations were found between the SAPS AVH item and any of the hallucination items for the BP/AVH+ group.

People with BD-I and AVHs were found to have lower subjective SES and a tendency for lower employment rates than those without AVHs, which aligns with our hypotheses. However, while we expected the AVH group to exhibit functional impairments as assessed by years of education, disability status, housing situation, and student status, there was no significant difference found

between groups. Previous research on people with AVHs (general population and those with schizophrenia only) found several indications of functional impairment in addition to lower SES and unemployment (Kr Akvik et al. 2015; Varese et al. 2011). Others have noted that people with BD and schizophrenia with AVHs vs. without AVHs exhibited greater working memory impairments (Gupta et al. 2018; Jenkins et al. 2018), and abnormalities in neural networks related to attention, emotion processing, speech production/processing, and memory (Kühn and Gallinat 2012; Qiu et al. 2020). By extension, such cognitive and emotional impairments could translate to daily functional impairments. A meta-analysis (Depp et al. 2012) reported significant relations between cognitive abilities (i.e., verbal learning, working and visual learning memory) and daily functioning (measured by clinician and self-report ratings, functional milestones, and performance-based tasks) in BD-I patients. Studies have also reported correlations between cognitive function and social and occupational functioning in both symptomatic and euthymic BD-I patients (Baune and Malhi 2015). Our data suggest functional impairments in people with BD-I and AVHs as operationalized by lower self-reported SES and a tendency for decreased employment rates, speaking perhaps to lower socioeconomic productivity in this cohort. Granted, other positive symptoms/greater illness severity likely accounted for some of this variance (see Supplementary Table 1); larger epidemiological studies are required to home in on the specific contributions of AVHs on clinical and socioeconomic features of this feature in BD.

The AVH group exhibited increased positive symptoms – specifically, hallucinations (AVHs as well as other types), delusions, and bizarre behavior – in comparison to the non-AVH group. These results align with previous research in people with schizophrenia (Chang et al. 2015; Chen et al. 2015; Larøi et al. 2012; Wang et al. 2021) and BD (Smith et al. 2017; Toh et al. 2015). Collectively, this suggests that the presence of AVHs corresponds to the worsening of other psychotic symptoms. Past studies have shown that positive symptoms are correlated with each other; further, greater positive symptoms (especially hallucinations and delusions) predicted higher rates of illness recurrence, relapse, hospital admissions, and suicide attempts in BD (Smith et al. 2017; Wilson and Sponheim 2014), underscoring the need for more proactive and intensive treatment approaches for this population. The only positive symptom that the groups did not significantly differ on was positive formal thought disorder. Past studies have shown that this symptom is more severe in people with schizophrenia compared to people with BD-I (Yalincetin et al. 2017), which could explain our results.

AVH presence was accompanied by elevated manic symptoms, as well as more time spent in manic episodes over the past decade (retrospective, self-report). Several studies have also reported that AVHs were more associated with manic and mixed-manic episodes in people with BD (Baethge et al. 2005b; Smith et al. 2017). This may indicate a connection between the co-occurrence of mania and psychotic features in BD-I. Indeed, significant overlap has been observed between manic and positive symptoms, which corroborates the proposition of psychosis as a spectrum disorder that includes BD-I (Cradock et al. 2009; Dunayevich et al. 2000; Simonsen et al. 2011). These findings suggest that people with BD-I and AVHs (as well as other positive symptoms) experience exacerbated, more chronic manic symptoms, which can lead to lower quality of life and poorer clinical outcomes. This highlights the need for specialized early detection and treatment strategies that address psychosis and mania in concert.

No differences existed between groups on depressive symptom severity. Psychotic features in BD, such as AVHs, can manifest during manic and depressive (and mixed) episodes (Chakrabarti and Singh 2022). Some have reported that AVHs in people with BD-I are less associated with depressive vs. manic episodes, while others report the opposite (Hammersley et al. 2010; Smith et al. 2017; Toh et al. 2015). AVH severity in patients with schizophrenia was associated with more severe depressive symptoms and lower social functioning (Abdelraof et al. 2023; Wang et al. 2019). It is feasible that AVHs have less influence/interaction with depression features and depression severity in BD-I; however, this needs to be assessed with larger samples.

Finally, our exploratory analyses indicated that there were no significant correlations between AVH severity and the severity of other hallucination types for the BP/AVH+ group. While there is limited precedent literature on this, our findings are inconsistent with previous work noting correlations between AVHs and other types of hallucinations (visual, tactile/somatosensory, and olfactory) in people with schizophrenia (Eve Lewandowski et al. 2009; Mueser et al. 1990). It is feasible that the relatively modest severity of AVHs in our sample might contribute to the lack of notable relations with other hallucinatory features.

While novel, several limitations of the above work must be acknowledged. First, only a small percentage (~11%; $n = 13$) of the cohort identified as a racial minority, which may impact generalizability. Second, the smaller sample of people with BD-I and AVHs (vs. without) may result in less precise power estimates. Future studies with larger and more diverse samples are warranted to fully investigate the clinical and socioeconomic effects of AVHs in people with BD-I. Further, the retrospective symptom

burden data was collected using self-report methods rather than direct measurements; these might be impacted by both recall bias and insight into symptoms, and limits reliability. While only used to supplement findings from clinical rating analyses, we acknowledge this method has not been validated. Nevertheless, the retrospective data on mania corroborate and expand upon the YMRS symptom data by offering a glimpse into long-term manic profiles. Also, we acknowledge that the use of subjective SES might be a limitation. Income was not collected as part of the study, but this measure might not have accurately captured SES in our cohort. This study was conducted in the metro area of Iowa, a university/college town with ~30,000–40,000 students (out of a population of ~75,000). These students might report a low income because of part-time employment or no employment during school; thus, years of education might better reflect their objective SES. Nevertheless, objective measures of SES should be utilized in future studies.

Finally, after completing data collection and analyses, it was discovered that portion of people with BD and AVH- ($N = 30$) were asked about their hallucinatory status in the *past month* (vs. lifetime, as was asked for the remainder of participants [$N = 53$]). As such, it is feasible that these people were miscoded (i.e., a portion of the $N = 30$ might have been lifetime hallucinators). To address this possibility, sensitivity analyses were carried out by excluding these $N = 30$ people from our AVH- group. Our results did not change substantially; the exception was that disability status was no longer significant while SES reached significance (likely due to power issues). This sensitivity analyses, coupled with the fact that the inclusion of the $N = 30$ people with BD and AVH- in the past month (vs. lifetime) biases analyses to the null hypotheses, and that -based on previous work- only a minority would be miscoded, suggests that our data, as presented, are robust.

In summary, AVHs in people with BD-I were found to be associated with functional impairments manifesting as unemployment and subjective socioeconomic hardship, as well as more severe positive (specifically other types of hallucinations, delusions, and bizarre behavior) and manic symptoms. While this research contributes to the growing body of research characterizing people with BD-I and AVHs, larger-scale studies with more in-depth investigation into demographic, socioeconomic, cognitive, clinical, and neural features are needed. Such insight might inform more tailored treatment approaches for this clinical population, thus improving functional outcomes and quality of life.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s40345-025-00369-8>.

Supplementary Material 1

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Author contributions

NJ, JF, and VM had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. JGR, EJB, and JAW were responsible for the recruitment and collection of data from participants. AJ analyzed the data and wrote the manuscript. All authors read and approved the final manuscript.

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Data availability

Due to the sensitive nature of the questions asked in this study, survey respondents were assured raw data would remain confidential and would not be shared.

Declarations**Competing interests**

The authors declare no competing interests.

Ethical approval

All work described here was performed with approval from the University of Iowa Institutional Review Board. All research participants provided written informed consent.

Data statement

Due to the sensitive nature of the questions asked in this study, survey respondents were assured raw data would remain confidential and would not be shared..

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