Neuropsychiatric Disease and Treatment

Dovepress
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ORIGINAL RESEARCH

Affective Temperaments and Seasonality in Patients with Mood Disorders

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Background: Major depressive disorder (MDD) and bipolar disorder (BD) are complex and disabling mental disorders, requiring a clinical characterization to improve patients' outcome. Affective temperaments and seasonality are associated with illness severity and prognosis in mood disorders, but are rarely explored in clinical practice.

Methods: The impact of affective temperaments on seasonality has been explored in real-world patients suffering from MDD, BD-I or BD-II through the brief version of the *Munster Temperament Evaluation of the Memphis, Pisa, Paris and San Diego* (b-TEMPS-M) and the *Seasonal Pattern Assessment Questionnaire* (SPAQ). Patients' levels of anxiety, depressive, and manic symptoms as well as trait-impulsivity, quality of life and global functioning were also explored through standardized assessment instruments. Associations were tested by univariate and multivariate analyses.

Results: The 100 recruited participants were mostly female (68%) with a mean age of 45.1±14.0 years. Sixty-six percent of them had a diagnosis of MDD and 34% of BD. Forty-seven patients had a seasonal pattern of the disorder, as shown by a Global Seasonality Score (GSS) at SPAQ >10. GSS mean value significantly correlated with b-TEMPS-M depressive ($p<0.01$), anxious ($p<0.01$) and cyclothymic ($p<0.01$) scores; linear regression showed an association between GSS and b-TEMPS-M depressive ($p<0.01$) and anxious ($p<0.05$) subscales, and with trait-impulsivity ($p<0.05$).

Conclusion: Depressive and anxious temperaments increase the risk of a seasonal pattern of mood disorders. Assessing affective temperaments and seasonality may be useful in the clinical characterization of the individual patient in order to better personalize the management of MDD and BD.

Keywords: major depression, bipolar disorder, mood disorder, temperaments, seasonality

Background

Major depressive disorder (MDD) and bipolar disorder (BD) affect around 4.3% and 1% of the global population, respectively,[1–4] having significant impact on patients' daily functioning and quality of life.[5–20]

Both MDD and BD are characterized by clinical complexity and heterogeneity, which affect response to pharmacological and non-pharmacological treatments.[21–25] According to the most recent guidelines, a personalized and integrated approach is needed to achieve patients' full functional recovery.[13,26–38] In this regard, some psychopathological domains, including seasonal pattern and temperaments, may significantly contribute to severity, clinical course and treatment response. However, these domains are rarely considered in routine care, and they are not even listed among criteria to be evaluated by the majority of international guidelines or diagnostic manuals.[23,25,39]

Melancholy and mania were described since ancient times, in typical association with autumn and summer, respectively, showing the relationship between seasonality and mood swings.[40] In 1984, Rosenthal et al[41] proposed the construct of Seasonal Affective Disorder (SAD), characterized by MDD episodes recurring during the fall and persisting

Received: 19 March 2025
Accepted: 8 July 2025
Published: 25 September 2025

in winter due to the photoperiod reduction. Thereafter, SAD with summer depression and winter hypomania[42] and sub-syndromic SAD[43] have also been described. Both the *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition* (DSM-5)[44] and the *International Classification of Disease, 11th Revision* (ICD-11)[45] include the specifier "with seasonal pattern", to be used when affective symptoms of MDD and BD begin and end in one season every year.

Seasonality affects women four times more than men, and prevalence rates increase with Northern latitudes,[46,47] ranging from 3% in Saudi Arabia[48] to 21% in Norway.[49] Patients suffering from BD report higher seasonal fluctuations compared to those with MDD.[50] The association between seasonality and clinical profiles of mood disorders has been extensively explored. A systematic review by Geoffroy et al[51] highlighted that people with seasonal BD were more likely to suffer from bipolar II disorder, comorbid eating disorders, recurrent episodes and rapid cycling in comparison with those experiencing non-seasonal episodes. Instead, a greater heterogeneity affects the clinical characterization of seasonal depression.[52–56] Effect of seasonality on cognitive performance was clearly demonstrated among patients with type I BD,[57] but not among those suffering from MDD.[58] Moreover, evidence of the associations of a seasonal pattern with psychotic symptoms,[59] suicidality,[60–62] need for hospitalization[62] and alcohol abuse[63,64] has been documented.

A robust body of research is available on the association between clinical correlates of mood disorders and affective temperaments,[65–77] defined as the biological and stable core of personality.[78] Hagop Akiskal et al[79] identified cyclothymic, depressive, irritable, hyperthymic and anxious temperaments, each reflecting different level of energy, reactivity and cognition. In a multicentric Italian study on patients suffering from mood disorders in euthymic phase, Simonetti et al[76] found that cyclothymic, irritable and hyperthymic temperaments were more associated with BD, whereas anxious and depressive dispositions with MDD. The evaluation of temperaments can help to better characterize mood disorders in the framework of a "broad bipolar spectrum",[79–86] similarly to the seasonal pattern of symptoms.

To the best of our knowledge, a very few evidence exists about the association between seasonality and temperaments in patients with BD.[87] Given these premises, the current research aims to investigate the impact of affective temperaments on seasonality in a group of patients with MDD or BD. Associations of seasonal pattern of mood disorders with clinical and daily functioning variables were tested as secondary outcomes.

Methods

Participants

This cross-sectional study was carried out at the Mood Disorders Outpatient Unit of the Department of Psychiatry of the University of Campania "Luigi Vanvitelli" in Naples, Italy. Patients were consecutively enrolled if they met the following inclusion criteria: 1) having a diagnosis of MDD, BD-I or BD-II, according to the DSM-5 criteria[44] and confirmed by the *Structured Clinical Interview for DSM-5*;[88] 2) having between 18 and 65 years; 3) being in a stable phase of the disorder since at least 6 months; 4) accepting to participate in the study by expressing written informed consent upon complete description of the protocol provided by a researcher. Exclusion criteria were: 1) not being able to express written informed consent to participate; 2) having a diagnosis of any neurological disease; 3) having a diagnosis of current drug abuse, according to the DSM-5 criteria.

Assessment

Patients' sociodemographic and clinical information was collected through ad-hoc schedules.

Anxiety symptoms were evaluated with the *Hamilton Anxiety Rating Scale* (HAM-A),[89] consisting of 14 items scored from 0 (absent) to 4 (severe). Total scores range from 0 to 56, where <17 indicating mild severity, 18–24 mild to moderate anxiety, while 25–30 moderate to severe condition.

Depressive symptoms were assessed by the clinician-reported *Hamilton Depression Rating Scale*,[90] a 17-item scale whose total score ranges from 0 to 52 points. A score of 16–25 indicates mild symptoms, the range 26–28 could suggest moderate depression, while a severe condition occurs when scoring >28 points.

Manic symptoms were assessed through the *Young Mania Rating Scale* (YMRS).[91] Levels of mobility, sexual desire, sleep, irritability, language, flight of ideas, grandiosity, aggression and insight are assessed by clinicians throughout 11 items.

Psychosocial functioning was investigated through the *Personal and Social Performance Scale* (PSP),[92] focusing on patients' social attitudes, interpersonal relationships, self-care and disturbing behaviors. A global functioning score is rated by researchers from 0 to 100.

The Italian version of the *Barratt Impulsiveness Scale* (BIS-11),[93] a self-administered 30-item scale, was used to assess trait-impulsivity levels. Items are scored on a 4-point Likert scale (1=rarely; 4=always/almost always).

Quality of life was assessed through the *Manchester Short Assessment of Quality of Life* (MANSA),[94] consisting of 12 items rated on a 7-point Likert scale.

Seasonality was assessed with the self-report *Seasonal Pattern Assessment Questionnaire* (SPAQ), developed by Rosenthal et al.[95] In the first part, seasonal changes in sleep duration, social activity, mood, weight gain, appetite and energy levels are rated through a 5-point Likert scale (0=no changes; 4=extremely marked changes). A Global Seasonality Score (GSS) ranging 0–24 is derived. According to the screening criteria by Kasper et al,[96] SAD occurs when GSS value is higher than 10. In another section of the SPAQ, patients report to perceive seasonal changes as moderate or severe problems and point out the months during which they feel worse, so as to configure a winter- or summer-type. In research setting only GSS can be used to assess SAD.[97]

Affective temperaments were assessed with the brief Italian version of the *Munster Temperament Evaluation of the Memphis, Pisa, Paris and San Diego* (b-TEMPS-M),[98] a self-report tool, comprising 35 items rated on a 5-point Likert scale. Five subscales can be obtained, each corresponding to an affective disposition.

Statistical Analysis

Sociodemographic and clinical characteristics, as well as assessment scores, were obtained through descriptive statistics. Data were presented as means (M) and standard deviations (SD), or as percentages (%) and frequencies (N), as appropriate.

T-test analyses were carried out to compare mean values of GSS between groups of participants based on: gender (males/females), having a partner (yes/no), being employed (yes/no), diagnosis (MDD/BD), having a family history of psychiatric disorder (yes/no), having a history of suicide attempts (yes/no), having current aggressive behaviors (yes/no), having psychotic symptoms in acute phases (yes/no), having psychiatric comorbidities (yes/no), having current alcohol abuse (yes/no), and having a history of substance abuse (yes/no).

Pearson correlation was performed to compare mean GSS values and sociodemographic and clinical variables, including assessment scores.

Linear regression analysis was carried out to test the association between GSS as dependent variable and current aggressive behavior, mean total scores of MANSA, HAM-A, HAM-D, BIS-11 and mean values of b-TEMPS-M depressive, anxious and cyclothymic subscales.

Statistical analyses were performed by using the Statistical Package for Social Sciences (SPSS), version 26.0. The level of statistical significance was set at $p<0.05$.

Results

Patients' Sociodemographic and Clinical Characteristics

This study included 100 participants, mostly women (68%) with a mean age of 45.1±14.0 years. Half of the sample (52.6%) lived with a partner and 41.0% were employed. Mean years of education were 13.4±4.8.

Sixty-six percent of participants had a diagnosis of MDD, and 34% suffered from BD. Onset of illness occurred at 34.3±14.3 years, with a mean duration of illness of 12.7±12.2 years. Fifty-two percent of participants had a family history of psychiatric disorders, and 15.5% reported a history of suicide attempts. Moreover, 14.6% of participants had psychotic symptoms during the acute phases of illness, and almost one third of them (32.3%) suffered from psychiatric comorbidities. Anxiety disorders represented the most common comorbidities, affecting 14.3% of the total sample, 17.2% of MDD patients and 8.8% of BD patients, without statistically significant differences between the two groups. Psychotic disorders (5.1%), eating disorders (5.1%), obsessive-compulsive disorder (3.1%), substance use disorders (3.1%) and

somatoform disorders (2.0%) co-occurred less frequently. Furthermore, 32% of all participants reported the presence of alcohol misuse (Table 1).

Mean value of BIS-11 total score was 70.6±14.0, while mean scores of BIS-11 motor impulsiveness, attentional impulsiveness and non-planning impulsiveness subscales were 24.9±7.1, 17.6±3.8 and 28.2±5.0, respectively. HAM-A and HAM-D total scores were 11.1±7.3 and 12.1±8.0, respectively; YMRS was on average 2.8±8.0; mean value of MANSA was 3.7±1.3; PSP mean score was 72.4±17.1. The mean scores of b-TEMPS-M subscales were: 21.7±7.6 for depressive temperament, 17.8±5.2 for hyperthymic, 19.7±7.7 for anxious disposition, 22.0±8.6 for cyclothymic type and 15.0±6.8 for the irritable temperament. Lastly, 47% of participants reported a SPAQ GSS>10, resulting in a mean value of 10.5±5.5.

Table 1 Sociodemographic and Clinical Characteristics of the Global Sample (N=100)

Age, M (SD)	45.1 (14.0)
Gender, female, % (N)	68.0 (68)
Body Mass Index, kg/m^2, M (SD)	27.9 (14.9)
Living situation, with partner, yes, % (N)	52.6 (51)
Years of education, M (SD)	13.4 (4.8)
Employed, yes, % (N)	41.0 (41)
Diagnosis, % (N) Depression Bipolar Disorder	 66.0 (66) 34.0 (34)
Age at onset, years, M (SD)	34.3 (14.3)
Age at first psychiatric consultation, years, M (SD)	34.3 (13.0)
Duration of illness, years, M (SD)	12.7 (12.2)
Family history of psychiatric illness, yes, % (N)	52.0 (51)
Number of hospitalizations, M (SD)	0.4 (0.8)
History of suicide attempts, yes, % (N)	15.5 (15)
Aggressive behaviors, yes, % (N)	28.9 (28)
Presence of psychotic symptoms during acute phases, yes, % (N)	14.6 (12)
Presence of psychiatric comorbidities, yes, % (N) Anxiety disorders, % (N) Psychotic disorders, % (N) Eating disorders, % (N) Obsessive-compulsive disorder, % (N) Substance use disorders, % (N) Somatoform disorders, % (N)	32.3 (32) 14.3 (14) 5.1 (5) 5.1 (5) 3.1 (3) 3.1 (3) 2.0 (2)
Current alcohol abuse, yes, % (N)	32.0 (31)
History of substance use, yes, % (N)	22.7 (22)
BIS-11, total score, M (SD)	70.6 (14.0)
BIS-11, motor impulsiveness score, M (SD)	24.9 (7.1)
BIS-11, attentional impulsiveness score, M (SD)	17.6 (3.8)

(*Continued*)

Table 1 (Continued).

BIS-11, non-planning impulsiveness score, M (SD)	28.2 (5.0)
b-TEMPS-M, depressive temperament score, M (SD)	21.7 (7.6)
b-TEMPS-M, hyperthymic temperament score, M (SD)	17.8 (5.2)
b-TEMPS-M, anxious temperament score, M (SD)	19.7 (7.7)
b-TEMPS-M, cyclothymic temperament score, M (SD)	22.0 (8.6)
b-TEMPS-M, irritable temperament score, M (SD)	15.0 (6.8)
HAM-A, total score, M (SD)	11.1 (7.3)
HAM-D, total score, M (SD)	12.1 (8.0)
MANSA, total score, M (SD)	3.7 (1.3)
YMRS, total score, M (SD)	2.8 (8.0)
PSP, total score, M (SD)	72.4 (17.1)
SPAQ, GSS, M (SD)	10.5 (5.5)
GSS>10, % (N)	47.0 (47)

Abbreviations: BIS-11, Barratt Impulsiveness Scale-11; b-TEMPS-M, Munster Temperament Evaluation of the Memphis, Pisa, Paris and San Diego, brief Italian version; GSS, Global Seasonality Score; HAM-A, Hamilton Anxiety Rating Scale; HAM-D, Hamilton Depression Rating Scale; MANSA, Manchester Short Assessment of Quality of Life; PSP, Personal and Social Performance Scale; SPAQ, Seasonal Pattern Assessment Questionnaire; YMRS, Young Mania Rating Scale.

Univariate Analyses

GSS mean values only differed between participants with and without current aggressive behaviors (12.3±4.9 vs 9.8±5.5; $p<0.05$). On the contrary, no significant differences were detected regarding other sociodemographic and clinical variables (Figure 1).

Correlations between seasonality and sociodemographic characteristics, clinical features and mean scores of assessments are reported in Table 2. GSS significantly correlated with all BIS-11 scores (total: $r=0.437$; motor impulsiveness: $r=0.378$; attentional impulsiveness: $r=0.441$; non-planning: $r=0.274$; $p<0.01$), b-TEMPS-M depressive ($r=0.291$;

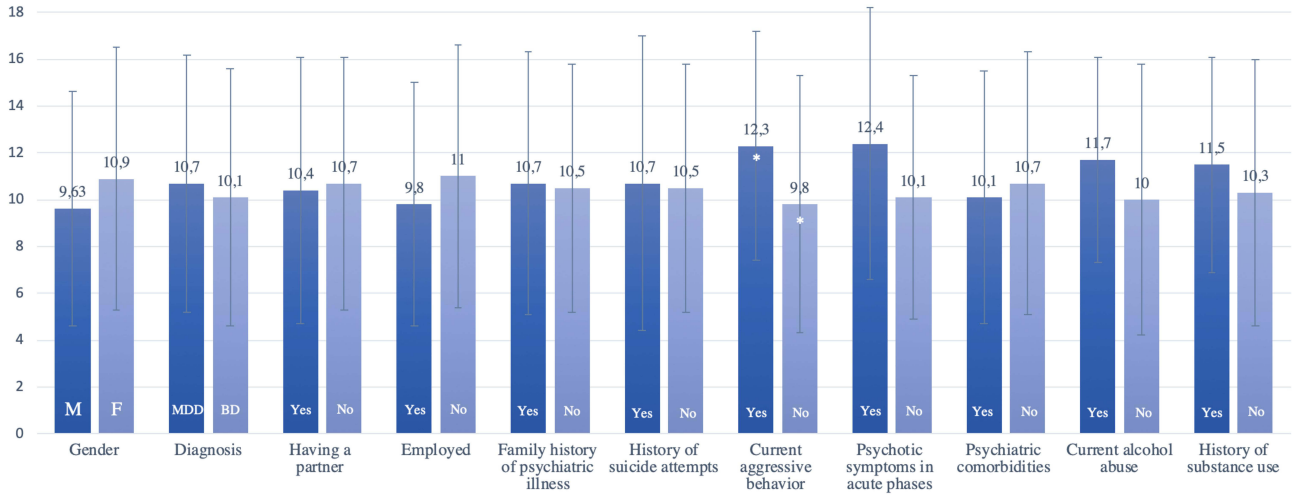

Figure 1 Univariate analyses comparing Global Seasonality Score between groups basing on sociodemographic and clinical characteristics. *p <0.05.

https://doi.org/10.2147/NDT.S529156

Table 2 Pearson Correlations Between Global Seasonality Score and Sociodemographic and Clinical Variables

	Global Seasonality Score
Age, M (SD)	−0.195
Years of education, M (SD)	−0.312**
Age at onset, years, M (SD)	0.20
Age at first psychiatric consultation, years, M (SD)	−0.57
Number of hospitalizations, M (SD)	0.110
BIS-11, total score, M (SD)	0.437**
BIS-11, motor impulsiveness score, M (SD)	0.378**
BIS-11, attentional impulsiveness score, M (SD)	0.441**
BIS-11, non-planning impulsiveness score, M (SD)	0.274**
b-TEMPS-M, depressive temperament score, M (SD)	0.291**
b-TEMPS-M, hyperthymic temperament score, M (SD)	0.008
b-TEMPS-M, anxious temperament score, M (SD)	0.418**
b-TEMPS-M, cyclothymic temperament score, M (SD)	0.406**
b-TEMPS-M, irritable temperament score, M (SD)	0.143
HAM-A, total score, M (SD)	0.243*
HAM-D, total score, M (SD)	0.238*
MANSA, M (SD)	−0.312**
YMRS, M (SD)	−0.101
PSPS, M (SD)	−0.167

Note: *p <0.05; **p <0.01.

Abbreviations: BIS-11, Barratt Impulsivene.ss Scale-11; b-TEMPS-M, Munster Temperament Evaluation of the Memphis, Pisa, Paris and San Diego, brief Italian version; HAM-A, Hamilton Anxiety Rating Scale; HAM-D, Hamilton Depression Rating Scale; MANSA, Manchester Short Assessment of Quality of Life; PSPS, Personal and Social Performance Scale; YMRS, Young Mania Rating Scale.

p<0.01), anxious (r=0.418; p<0.01) and cyclothymic scores (r=0.406; p<0.01), HAM-A (r=0.243; p<0.05) and HAM-D total scores (r=0.238; p<0.05). On the contrary, GSS negatively correlated with years of education (r=−0.312; p<0.01) and MANSA total score (r=−0.312; p<0.01).

Linear Regression Analysis

At the linear regression model (Table 3), the likelihood of having a seasonal pattern was increased in patients with higher scores at the b-TEMPS-M depressive (B=0.118; 95% CI: 0.031 to 0.205; p<0.01) and anxious subscales (B=0.161; 95% CI: 0.030 to 0.292; p<0.05), and at the BIS-11 total score (B=0.116; 95% CI: 0.022 to 0.210; p<0.05). A negative association was found between GSS and MANSA total score (B =−0.241; 95% CI: −0.481 to −0.001; p<0.05).

Discussion

Seasonality and affective temperaments are independently associated with clinical features of mood disorders.[51,56,76,99] Nevertheless, only a few studies have explored the effect of temperaments on seasonality in patients suffering from MDD or BD. To our knowledge, this association was tested only by Altınbaş et al[87] in a cohort of sixty-six outpatients suffering

Table 3 Linear Regression Analysis Exploring the Impact of Sociodemographic and Clinical Characteristics on Global Seasonality Score (Dependent Variable)

Variables	B	Sign.	95% Confidence Interval
Current aggressive behavior	0.494	0.689	−1.925 to 2.913
MANSA Total score	**−0.241**	**0.049**	**−0.481 to −0.001**
HAM-A Total score	−0.076	0.549	−0.325 to 0.173
HAM-D Total score	0.062	0.588	−0.162 to 0.286
BIS-11, Total score	**0.116**	**0.016**	**0.022 to 0.210**
b-TEMPS-M, depressive subscale	**0.118**	**0.008**	**0.031 to 0.205**
b-TEMPS-M, anxious subscale	**0.161**	**0.016**	**0.030 to 0.292**
b-TEMPS-M, cyclothymic subscale	0.083	0.250	−0.058 to 0.224

Note: Statistically significant associations (p <0.05) have been reported in bold.
Abbreviations: BIS-11, Barratt Impulsiveness Scale-11; b-TEMPS-M, Munster Temperament Evaluation of the Memphis, Pisa, Paris and San Diego, brief Italian version; HAM-A, Hamilton Anxiety Rating Scale; HAM-D, Hamilton Depression Rating Scale; MANSA, Manchester Short Assessment of Quality of Life.

from BD-type I. Thus, our study aimed to increase knowledge about this understudied topic, given the important implications of a better understanding of the link between affective dispositions and seasonal recurrence on prevention, identification and clinical management of mood disorders.

One of the novelties of our study was the inclusion of patients suffering from MDD alongside those with BD. This choice is due to the fact that both MDD and BD may have a seasonal pattern,[100] and that temperaments should not be considered as distinct compartments.[101] Moreover, we used the GSS score as a continuous variable, thus adopting a dimensional approach. Indeed, despite GSS can be assumed as an indicator of seasonality when scored more than 10,[97] the sensitivity of this cut-off has been criticized.[102,103] Furthermore, the study of the associations of GSS with some clinical variables, such as impulsiveness, depressive, anxiety and manic symptoms, allowed to further increase knowledge around seasonal pattern of mood disorders.

One of the main findings of our study was the presence of a significant correlation between depressive, anxious and cyclothymic temperaments and seasonality ($p<0.01$). However, this finding was partially confirmed at the multivariate analyses, where only an association between GSS and depressive ($p<0.01$) and anxious ($p<0.05$) dispositions were found. It could be argued that seasonal recurrence of affective symptoms might resonate with mood and energy changes characterizing cyclothymic course, but the more robust association with depressive temperament might lie in the affective polarity of SAD, a construct consisting of atypical and neuro-vegetative symptoms, such as sadness, lack of energy, lethargy and hyperphagia. On the other hand, the effect of anxious temperament might subtend levels of concern and apprehension related to mood changes.[55,104,105] The loss of significant association between cyclothymic temperament and GSS in the multivariate analysis, despite univariate correlation, may lie in the fact that only one-third of the sample suffered from bipolar disorder, among whom cyclothymic temperament is more common; whereas, the remaining part consisted of patients suffering from depression. Also, the confounding effect of adjustment for trait-impulsiveness scores in the linear regression model should be considered, since prior research has found significant association between this dimension and cyclothymic disposition.[72]

The findings of the current study are in line with those reported by Altınbaş et al,[87] who also had previously noticed an effect of depressive temperament in predisposing winter peak of metabolic syndrome among patients with BD-I.[106] On the other hand, prior studies using the five-factor model of personality[107] had examined the association between SAD and neuroticism,[108,109] found in correlation with anxious, cyclothymic and depressive temperaments.[110]

We also tested the association between seasonality and other clinical variables. In particular, the linear regression model showed that higher impulsivity trait-related scores increased the likelihood of having a seasonal pattern of mood disorder ($p<0.05$), while an inverse association was found between GSS and MANSA total score.

Trait-impulsiveness has been found in correlation with both depressive and manic symptoms.[111] This finding confirms previous reports by Luciano et al,[72] who found a significant association between trait-impulsivity and seasonal patterns in a sample of 653 patients with mood disorders. This association can be due to the fact that impulsiveness is a significant contributor of mood instability in BD and is associated to mood shifts in BD. However, it has to be noted that only a few studies have explored the association between trait-related impulsiveness and seasonal pattern in mood disorders; thus, further studies are needed to explore whether this group represents a clinical distinct phenotype which includes impulsiveness and seasonality – and possibly other dimensions related to mood and behavioral instability, such as aggressive behaviors and impulsive suicide.

In our sample GSS significantly correlated with depressive symptoms, but not with manic symptoms. This result might be partially explained by considering that two-third of participants received a diagnosis of MDD, while only a minority suffered from BD. In the DSM-5 the specifier "with seasonal pattern" can be applied regardless of mood polarity.[44] Geoffroy et al[51] found a slightly higher overall prevalence of seasonal depressive symptoms (25%) compared to seasonal manic symptoms (15%); Goikolea et al[112] found a predominance of seasonal depressive phenotypes, while Yang et al[113] in a population-based study carried out in Taiwan showed a significant effect of gender, being more prominent in women rather than men. More recently, an undetermined predominant polarity of clinical course of BD was found in association with seasonality.[99] Furthermore, our findings demonstrating a significant correlation between seasonality and anxiety symptoms corroborate previous results.[114,115]

It is worth mentioning that MANSA total score was inversely associated with GSS, both at the Pearson correlation and at the multivariate analysis. Low levels of quality of life might be explained by functional and social impairment due to the recurrence of depressive episodes in limited periods of the year,[116] as well as the perceived decrease of wellbeing when compared to the lighter periods.[117] Furthermore, patients suffering from SAD reported poorer mental health functioning than subjects with non-seasonal depression.[118]

Another interesting finding from our study is the inverse correlation between years of education and GSS, which is in line with that obtained by Øyane et al.[119] In contrast, in the Netherlands Study of Depression and Anxiety (NESDA), this variable did not differ significantly between subjects with SAD, patients suffering from non-seasonal mood disorder and healthy controls.[55]

The current study should be considered in the light of several limitations.

First, the sample size of 100 subjects may be too small to generalize the results. In this regard, we plan to replicate the current analyses by including a larger number of subjects suffering from mood disorders, by extending recruitments to other university centers.

Second, the cross-sectional study design did not allow us to capture changes occurring across different seasons. Participants were consecutively enrolled, regardless of any critical correlation with seasonal relapses. However, it is noteworthy that SPAQ is a validated tool for performing retrospective analyses of seasonality, contributing to mitigate this limitation, although it is necessary to consider a possible risk of recall bias. The same applies to b-TEMPS-M, which, despite being a validated tool in clinical sample,[98] may have a potential risk of recall-bias, being self-administered.

Third, although stable clinical conditions were required among inclusion criteria and the mean scores of the HAM-D, HAM-A, and YMRS scales resulted all below the threshold indicative of mild symptom severity, residual symptoms may have occurred in our real-world patient-based sample. In order to partially balance this bias, HAM-D and HAM-A total scores were included in the multivariate analyses as independent variables, adjusting the results. Anyway, mild symptoms – especially depressive ones – may affect the results by leading to an overestimation of b-TEMPS scores.

Fourth, MDD and BD show different clinical features and outcomes, with the former being highly heterogenous and not always characterized by the presence of seasonal course. In order to assess the relationship among seasonality and affective temperaments within the two diagnoses, a subgroup analysis would be necessary, which was not possible in the present study given the small sample size. However, we plan to increase our sample size, in order to verify if the relationship among temperaments and seasonality varies among MDD and BD patients.

Another limitation of the present study is the absence of an a priori power calculation, due to the exploratory nature of the analysis and the lack of existing data. However, an expansion of the sample size is currently being planned in order to strengthen the statistical robustness of future analyses. Given these reasons, further research is needed to better characterize the effect of temperaments on MDD and BD with seasonal recurrence.

Conclusions

MDD and BD are frequent recurring mood disorders, characterized by high levels of disability and impairment in daily functioning. The complexity of both syndromes requires an adequate clinical characterization of individual patients, according to a personalized and tailored approach. In this respect, it appears necessary to explore affective temperaments and seasonality, since accumulating research have found that they are independently associated with severity and prognostic correlates. Evaluating temperamental dispositions and seasonal pattern of illness could drive clinical strategies aimed at achieving full patients' recovery.

Data Sharing Statement

All data generated or analyzed during this study are included in this published article.

Ethics Approval and Consent to Participate

This research was conducted in accordance with globally accepted standards of good practice, in agreement with the Declaration of Helsinki and with local regulations, having been approved by the Ethics Committee of University of Campania "Luigi Vanvitelli", Naples. Written informed consent was released by all participants.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

There is no funding to report.

Disclosure

The authors declare that they have no competing interests in this work.

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