

Provided for non-commercial research and education use.
Not for reproduction, distribution or commercial use.



This article appeared in a journal published by Elsevier. The attached copy is furnished to the author for internal non-commercial research and education use, including for instruction at the authors institution and sharing with colleagues.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/authorsrights>



Contents lists available at ScienceDirect

Journal of Affective Disorders

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

Research report

Increased energy/activity, not mood changes, is the core feature of mania



Elie Cheniaux^{a,*}, Alberto Filgueiras^b, Rafael de Assis da Silva^c,
Luciana Angélica Silva Silveira^d, Ana Letícia Santos Nunes^d, J. Landeira-Fernandez^e

^a Instituto de Psiquiatria da Universidade Federal do Rio de Janeiro (IPUB-UFRJ), Universidade do Estado do Rio de Janeiro (UERJ), Brazil

^b Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), Brazil

^c Instituto de Psiquiatria da Universidade Federal do Rio de Janeiro (IPUB-UFRJ); Instituto Philippe Pinel, Brazil

^d Instituto de Psiquiatria da Universidade Federal do Rio de Janeiro (IPUB-UFRJ), Brazil

^e Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio); Universidade Estácio de Sá, Brazil

ARTICLE INFO

Article history:

Received 17 September 2013

Accepted 24 September 2013

Available online 3 October 2013

Keywords:

Bipolar disorder

Mania

Mood change

Hyperactivity

Factor analysis

Item Response Theory

ABSTRACT

Background: In the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition, the occurrence of increased energy/activity and elation of mood or irritability became necessary symptoms for the diagnosis of an episode of mania or hypomania.

Objective: To evaluate whether increases in energy/activity or mood changes represent the core feature of the manic syndrome.

Methods: The symptomatology of 117 hospitalized patients with bipolar mania was evaluated using the Schedule for Affective Disorders and Schizophrenia-Changed version (SADS-C). Based on six items of the SADS-S related to mania, a Confirmatory Factor Analysis (CFA) was performed. An Item Response Theory (IRT) analysis was used to identify how much each symptom informs about the different levels of severity of the syndrome.

Results: According to the CFA, the item “increased energy” was the symptom with the highest factorial loadings, which was confirmed by the IRT analysis. Thus, increased energy was the alteration most correlated with the total severity of manic symptoms. Additionally, the analysis of the Item Information Function revealed that increased energy was correlated with the larger amplitude of severity levels compared with the other symptoms of mania.

Limitations: Only six manic symptoms were considered. The sample might not be representative because the patients were evaluated while presenting peak symptom severity.

Conclusions: Increased energy/activity is a more important symptom for a diagnosis of mania than mood changes and represents the core feature of this syndrome.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

In the description of manic and depressive states, Kraepelin (1921) referred to changes in mood, thinking, and activity, without emphasizing any of these components specifically. However, modern diagnostic criteria used in psychiatry, such as the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV; APA, 1994), and *International Statistical Classification of Diseases and Related Health Problems*, 10th revision (ICD-10; WHO, 1993), have classified both bipolar disorder and unipolar depression as mood disorders, thus emphasizing the first component to the detriment of the other two.

In the last decades, some studies have investigated the phenomenology of mania by performing a factor analysis of the symptoms. A factor related to hyperactivity was identified in several studies. Based on the results, the authors concluded that increased motor activity not only was more important than changes in mood in characterizing mania but also represents the core feature of the syndrome (Bauer et al., 1991; Akiskal et al., 2001, 2003; Benazzi and Akiskal, 2003; Benazzi, 2007).

As a consequence of this new point of view, the criteria for diagnosing manic and hypomanic episodes were modified in the DSM-V (APA, 2013). In the new classification, euphoria or irritability continues to be necessary, but an increase in energy or activity must also be present for the diagnosis of mania or hypomania.

The objective of the present study was to evaluate whether increased energy and motor activity represent the core feature of the manic syndrome in a sample of hospitalized patients who presented an acute episode of mania.

* Correspondence to: Av. N. Sra. Copacabana, 1066/1101, Copacabana, Rio de Janeiro, RJ 22060-002, Brazil. Tel./Fax: +55 21 3148 1465.
E-mail address: echeniaux@gmail.com (E. Cheniaux).

2. Methods

The study was conducted in the infirmary of the Institute of Psychiatry, Federal University of Rio de Janeiro, Brazil. The local ethical committee approved the study, and all of the patients gave verbal consent.

Patients who were hospitalized from June 2010 to August 2011 were evaluated using the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998), a structured interview that allows the formulation of psychiatric diagnoses according with the criteria of the DSM-IV (APA, 1994) and ICD-10 (WHO, 1993), which was validated and translated to Brazilian Portuguese (Amorim, 2000). In cases in which the same patient was hospitalized more than once during the study period, only the first hospitalization was considered.

The patients who met the DSM-IV criteria for an actual manic episode were administered the Schedule for Affective Disorders and Schizophrenia-Changed version (SADS-C; Spitzer and Endicott, 1978). The SADS (Endicott and Spitzer, 1978) is a diagnostic tool based on the Research Diagnostic Criteria (RDC; Spitzer et al., 1978). The SADS-C constitutes a scale of 37 items in which the presence and intensity of manic, depressive, anxiety, and psychotic symptoms are evaluated. The SADS was translated to Portuguese and validated in Brazil (Furlanetto and Bueno, 1999).

Both the MINI and SADS-C were applied in the first 7 days of psychiatric hospitalization for each patient. All of the evaluators were psychiatrists who received training on the use of these tools by the principal investigator (EC). The evaluators were unaware of the goals of the study. The team of evaluators was divided into two groups: some applied the MINI, and others applied the SADS-C.

Based on the SADS-C results obtained in the evaluation of the hospitalized patients who presented actual mania, a Confirmatory Factor Analysis (CFA) was performed to identify the items that best fit the “mania” dimension as proposed by Spitzer and Endicott (1978). The structure of two different models was studied: mania with five items/symptoms (Rogers et al., 2003) and mania with six items/symptoms, including “anger” because of possible presence of this symptom according to theoretical considerations (Johnson et al., 1986). The unidimensionality of the models was tested using LISREL 8.80 software (Jöreskog and Sörbom, 1996) based on the method of full-information maximum likelihood using the polychoric correlation matrix as suggested by Jöreskog and Moustaki (2001), considering that the SADS-C is an ordinal response tool. For data interpretation, we followed the protocol of Hair et al. (2009), who suggested some indices, the error, and goodness of fit. For this analysis, we verified the Goodness of Fit Index (GFI), Normed Goodness of Fit Index (NGFI), Parsimony Goodness of Fit Index (PGFI), χ^2 and significance (coefficients of adjustment to the model), and the Root Mean Square of Error Approximation (RMSEA; an error index).

Subsequent to the confirmation of the unidimensionality of the “mania” dimension of the SADS-C, an Item Response Theory (IRT) analysis was performed to identify how much each of the symptoms revealed the different levels of severity (θ) of the symptoms during the manic episode. This approach allowed the identification of the symptoms that are likely most critical in mania. A two-parameter model was used that included a graduated response model (2P-GRM; Samejima, 1997), which was an adapted version of the ordinal graduated responses from the logistic models of two (2PL) and three (3PL) parameters for the dichotomous items of Birnbaum (1968). The standard parameters of IRTPro 2.1 software (Scientific Software International, 2011) were used to calibrate the items and analysis in IRT.

The Item Information Function (IIF) was used to identify how much each item informed about the different levels of mania severity. The IIFs showed how much information is contained in

a specific symptom across all levels of the latent trait (i.e., the severity of the pathological state). For example, a symptom may reveal a lot about the severity of mania when the manic state is moderate ($\pm\theta=0.1$), but it may reveal little in a more severe state ($\pm\theta=1.5$). This means that when the severity of the clinical state is moderate in manic patients ($\pm\theta=0.1$), a specific symptom may inform more than the other symptoms. In contrast, when the clinical state is more severe ($\pm\theta=1.5$), the symptom is less informative than the other symptoms or may even be absent in the symptomatology. This allows the identification of several degrees of severity of the manic crisis, the symptoms of which are central and reveal more about the state of the patient. To determine whether the same symptom or different symptoms are prevalent along the spectrum associated with severity of mania, 60 points were determined for different levels, ranging from $\theta=-3.0$ to $\theta=+3.0$. Each point comprises a symptom that informs the most. All points were treated as categorical variables from which the total number of points of each symptom was scored. Hence, a percentage was calculated to determine how much the symptom was preponderant in relation to the latent trait. For example, if a symptom had information of 30 out of 60 points, then it preponderated in 50% of the latent trait. A χ^2 with the percentage was calculated to determine whether the symptom was significantly prevalent in relation to the other symptoms.

Finally, the summation of the IIF generates a Test Information Function (TIF). According to Purpura et al. (2010), a TIF can inform how much a group of items contributes to the understanding of the symptoms across the latent trait spectrum. Two different TIFs were calculated from the theoretical model proposed in the present study: a TIF for symptoms associated with increased energy/activity and a TIF for the symptoms associated with mood changes. Based on the TIFs, the same procedure of division of points was performed as described above. The χ^2 test revealed whether the group of symptoms associated with increased energy/activity in manic states was more or less statistically preponderant than symptoms associated with mood changes.

3. Results

During the period of the study, 419 patients were hospitalized, with a total of 481 admissions, considering that some of the patients were hospitalized more than once. A total of 167 patients were diagnosed with an actual manic episode. In 50 patients, the SADS-C was not applied because of several reasons: the patient's refusal to participate in the study, evasion from the hospital, and discharge from the hospital requested by the family. Therefore, the data analysis was based on the results of the SADS-C with 117 patients. Thirteen patients (11.1%) simultaneously met the criteria for an actual major depression episode that consequently led to a mixed-state diagnosis according to DSM-IV criteria.

Among the 117 patients, 49 (41.9%) were male and 68 (58.1%) were female, with no significant sex differences ($\chi^2=3.085$, $p=0.08$). The average age was 42.4 years ($SD=11.7$), and the average education was 8.8 years ($SD=3.2$). The average age at the first crisis was 24.3 years ($SD=8.5$). With regard to the first crisis, mania (57.3%) was significantly more frequent than depression (29.1%; $\chi^2=83.718$, $p<0.001$). Sixteen patients (13.6%) did not know to respond about their first crisis. The average number of hospitalizations per patient was 10.4 ($SD=10.5$).

The CFA with the two models (with five and six items) was performed to determine whether clustering all of the items of the SADS-C associated with mania is possible. The CFA revealed a better adjustment when six items were modeled together, indicating that the factorial structure with six items (i.e., increased energy, increased activity, elation of mood, increased self-esteem,

Table 1
Results of the confirmatory factor analysis.

Model	Coefficients of confirmatory factor analysis						
	χ^2	df	p-value	GFI	NGFI	PGFI	RMSEA
Mania with 5 items	302.03	284	$p < 0.05$	0.90	0.89	0.93	0.06
Mania with 6 items	256.08	288	$p = 0.09$	0.93	0.91	0.93	0.03

Table 2
Factor loadings of the items of Confirmatory Factor Analysis.

Item	Factor loading (λ_1)	Standard error
Increased activity	0.76	0.11
Less need for sleep	0.77	0.11
Increased energy	0.92	0.08
Elated mood	0.83	0.11
Increased self esteem	0.68	0.15
Anger	0.52	0.18

Table 3
Results of the IRT analysis using the 2P-GRM model with values of discrimination (a) and difficulty (b).

Item	Discrimination a	Difficulty				
		b_1	b_2	b_3	b_4	b_5
Increased activity	1.98	-0.78	-0.38	0.06	0.97	2.18
Less need for sleep	2.07	-0.39	0.1	0.2	0.64	1.57
Increased energy	4.05	-0.69	-0.51	-0.37	0.14	1.13
Elated mood	2.54	-0.52	-0.38	0.18	0.99	1.76
Increased self esteem	1.58	-0.84	-0.44	-0.15	1.05	3.61
Anger	1.02	-1.09	-0.6	0.14	1.88	-

less need for sleep, and anger) explained a larger portion of the variance. Notably, the model with five items presented significant differences between the model and empirical data, indicating that the variance in the present data was not explained by only these five items, with the need for an extra item for better adjustment. Table 1 shows the χ^2 values, degrees of freedom (df), p values for the comparisons of the model with empirical data, and GFI, NGFI, PGFI, and RMSEA for both models.

Based on the results, we decided to analyze the data of the model with the six items using IRT. The factorial loadings and standard error for each item of this model are presented in Table 2. Factorial loadings represent the correlation of the items with the factors. One can affirm that the item that correlates better with a factor is probably the one that better explains variance because the square of the factorial loading is equivalent to the percentage of variance explained by the item (Loehlin, 2009). Specifically with regard to the present data, the item that better explained the "mania" dimension was the symptom "increased energy," followed by "elation of mood" and "reduced need for sleep."

The IRT analysis for the "mania" dimension found in the CFA was performed using the 2P-GRM model (Samejima, 1997). The indices of discrimination (a) and difficulty (b) are shown in Table 3. A greater a value is associated with a greater item discrimination capacity (i.e., the ability to identify the severity of mania across the latent trait). For example, the greatest values in the present data were for "increased energy" ($a = 4.05$), suggesting that the capacity of this symptom to differentiate a patient with more severe mania from a patient with milder mania is the best among all of the items of the SADS-C. Conversely, the item "anger" ($a = 1.02$) is a symptom that differentiates patients with mania relatively little, with similar levels across severity levels.

The difficulty index identifies whether a symptom is rare or common in different severity levels (b). The index b_1 , for example, reveals the amount of a symptom that is necessary to produce 50% of the chance that the patient will score 0 or 1 on the SADS-C for that item. A lower b value is associated with less of that symptom being necessary for one of the two categories to be endorsed. For example, the symptom "anger" has a lower b_1 value (-1.09), indicating that patients with mania become easily irritated, although the severity of the remaining symptoms is appreciably high. In contrast, in order for a patient in mania to present "less need for sleep" ($b_1 = -0.39$), all of the other symptoms in the "mania" dimension of the SADS-C probably would have already been endorsed. The same occurs for the indices b_2 , b_3 , b_4 , and b_5 . Notably, for the symptom "anger," the absence of the index b_5 occurs because no patient presented elevated anger to the point that the last category of the scale would be endorsed.

The IIF of the "mania" dimension of the SADS-C is shown in Fig. 1. This figure shows the amount of information that each item reveals for the different severity levels (i.e., which symptom has to be considered with more caution when the patient is displaying hypomania or, at the other extreme, high levels of mania).

Values of information were established for each item among the points that represent the latent trait (θ) of -3.0 to 3.0 , for a total of 60 points. Fig. 1 shows that the symptom is more informative (i.e., the symptom that better reveals the severity of mania in the patients in the present study is "increased energy").

When the patient is close to hypomania ($-2.5 \leq \theta \leq -3.0$), the more informative symptom is "increased self-esteem," representing 9.8% of the latent trait. With regard to hypomania but at more severe levels ($-1.5 \leq \theta \leq -2.4$), "elation of mood" is the more informative symptom. At levels of the clinical state that are even more severe, "elation of mood" again appears as the most informative symptom with regard to the severity of the disorder ($\theta \geq 2.5$). Overall, this symptom explains 26.2% of the latent trait.

From severe mania levels to very high severity levels, the symptom "increased energy" appears to be the central symptom along virtually the entire spectrum of mania severity ($-1.4 \leq \theta \leq 1.6$). This occurred in 52.5% of the points that we defined for the latent trait. Finally, when mania was at more severe levels ($1.7 \leq \theta \leq 2.3$) but not yet at extreme levels, the most informative symptom was "increased activity," with 11.5% of the points.

The preponderance of the symptom "increased energy" (52.5%) relative to "elation of mood" (24.6%), "increased self-esteem" (9.8%), and "increased activity" (11.5%) was significant ($\chi^2 = 28.508$, $p < 0.001$). These results suggest that the symptom "increased energy" is the most informative along the latent trait and preponderant at the most important times in the symptomatology of a manic crisis.

Based on the results of the IIFs, we divided the "mania" dimension of the SADS-C into two groups by considering greater and lower clinical proximity between them. In one group, the

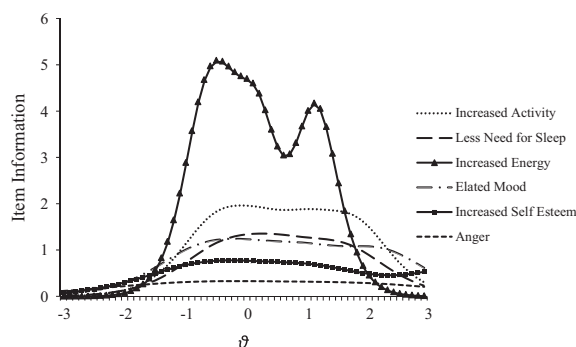


Fig. 1. Function of information of the item for each of the symptoms of the "mania" dimension of the SADS-C.

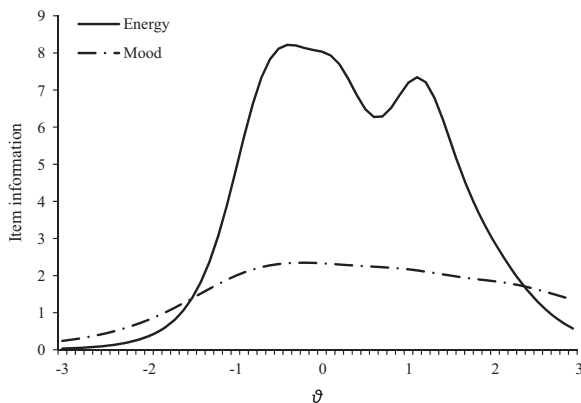


Fig. 2. Summation of the functions of information of the items for the two groups of three symptoms of the “mania” dimension of the SADS-C: symptoms of energy and symptoms associated with mood.

symptoms associated with energy included (1) increased energy, (2) increased activity, and (3) less need for sleep. In the other group, the symptoms associated with mood included (1) elation of mood, (2) increased self-esteem, and (3) anger. Based on this merely theoretical division, the values of the IIFs of each group that included the three symptoms were cumulated and are presented in Fig. 2.

Fig. 2 shows that the symptoms associated with energy comprised the central part of the latent trait (i.e., the most important symptoms to be considered in a manic patient). The symptoms associated with mood appeared to be more informative when the patient was having hypomania or when in the extreme phase of mania. In terms of θ , the symptoms associated with energy appeared to be more important for $-1.5 \leq \theta \leq 2.3$, representing 63.9% of the latent trait. The symptoms associated with mood are more informative when $-1.6 \leq \theta \leq 2.4$, representing 36.1% of the latent trait. A significant difference was found between the presence of symptoms associated with energy and symptoms associated with mood ($\chi^2=4.738$, $p < 0.05$). From the perspective of IRT, these results confirm that the symptoms related to energy appear to inform more about mania severity than mood symptoms.

4. Discussion

In the present study, we examined the symptomatology of 117 hospitalized patients with mania. The SADS-C was used for clinical evaluation. The CFA revealed that the mania factor had better adjustment when the item “anger” was added to the items of the SADS-S that were originally proposed.

The present results point to factorial structures of mania that are very similar to the ones reported in previous studies. The unidimensionality of the items of the SADS-C in relation to mania were also considered in the study by Spitzer and Endicott (1978) and confirmed by Lewine et al. (1983), Johnson et al. (1986), and Rogers et al. (2003). Johnson et al. (1986) proposed a theoretical division of SADS-C items in which mania was considered as one factor. Some other studies (e.g., Lewine et al., 1983, Rogers et al., 2003) used a factorial approach to search for a model that better explains the common variance of the empirical data. However, the unidimensionality was also confirmed with other statistical approaches, such as cluster analysis (Swann et al., 2013) and the Rasch model (Lewine et al., 1983). Therefore, identifying which symptom in this factor structure explains most of the data variance was possible (i.e., which symptom is central in the manic syndrome). From this perspective, the item that presents the

highest factorial loading is probably the one that contributes the most to the understanding of the manic syndrome.

According to the CFA, among all six symptoms of mania, the item “increased energy” was the one that presented the highest factorial loading, which was confirmed by IRT. Thus, the results indicate that increased energy is the alteration that correlates the most with the total severity of manic symptoms.

Additionally, the IIF showed that increased energy was correlated with a larger amplitude of mania severity, which was not observed only in rare extreme cases with a very low or extremely high intensity.

Finally, we divided the six items of the “mania” factor into two groups: one more related to energy (increased energy, increased activity, and less need for sleep) and another more related to mood (euphoria, increased self-esteem, and anger). Based on the study of the information of the item, we found that the group related to energy was more correlated with a larger amplitude of mania severity.

Importantly, we found that increased energy was more important than mood changes in mania, although the sample in this study was characterized by a bias toward mood changes because of the fact that we used the DSM-IV criteria (APA, 1994) to diagnose manic episodes, which requires the occurrence of euphoria or irritability but not increased energy or activity. Thus, all of the patients, without exception, presented changes in mood, but not all of them necessarily presented increased energy or activity.

Consistent with our results, several other studies that used factorial analysis concluded that increased energy or activity and not mood changes represent the core feature of the manic syndrome.

Bauer et al. (1991) performed a factorial analysis of self-applied visual analog scale data that evaluated manic and depressive symptoms. The Young Mania Rating Scale (YMRS; Young et al. 1978), an objective evaluation tool, was also used. The sample was composed of patients with bipolar disorder and unipolar depression and normal controls. The total scores on the YMRS were more correlated with the “activation” factor than with the other factors that were found, which represented basically mood changes, including the “well-being/depression” index and “perceived conflict” (irritability) index.

Akiskal et al. (2001) also performed a factorial analysis of visual analog scale data, but the sample was composed of only hospitalized patients (a total of 104 patients) in a manic state. Similar to Bauer et al. (1991), the authors found that the “activation” factor best correlated with an objective evaluation of manic symptoms with the use of the Beigel–Murphy Manic State Rating Scale (MSRS; Beigel et al., 1971). Using the same sample, Akiskal et al. (2003) also performed a factorial analysis of the MSRS data. Among the seven factors that were found, the “disinhibition–instability” factor was the one most correlated with the total scores on the scale of manic symptoms. According to these authors, this factor clinically represented a state of activation.

In the study by Benazzi and Akiskal (2003), type II bipolar patients and depressed unipolar patients completed the Mood Disorder Questionnaire (Hirschfeld et al., 2000) to retrospectively score the occurrence of previous hypomanic episodes after the remission of a depressive episode. The factorial analysis revealed only two factors: “energized-activity” and “irritability-racing thoughts.” Euphoria did not load onto any of the factors, leading to the conclusion that euphoria is not a sensitive symptom or pathognomonic for the diagnosis of hypomania.

With a sample similar to the previous study, Benazzi (2007) requested that patients recall the most frequent hypomanic symptoms that they experienced in previous episodes. Hyperactivity was the most common alteration reported by the patients with type II bipolar disorder and the one that was the most

strongly associated with this diagnosis. Three factors were found: “elevated mood,” “mental activation,” and “behavioral activation.” No relationship was found between hyperactivity and changes in mood (i.e., euphoria or irritability).

The present study presented a new technique for studies that seek to clarify the role of mood and activation symptoms in the manic syndrome. Item Response Theory represents a set of statistical techniques that was created in the mid-1950s but was only fully developed in the last two decades since the advent of computers with more robust processors (Embretson and Reise, 2000). Other studies of depressive disorders have benefited from these techniques (Olino et al., 2012; Wakschlag et al., 2012), but very few IRT studies have applied this analytical method to manic episodes.

At least two studies objectively reported an increase in motor activity in the manic syndrome. Minassian et al. (2010) placed patients with mania, patients with schizophrenia, and normal controls in an unfamiliar room that had unusual objects. Motor activity was monitored by a device that detected ambulation and found to be higher in patients with mania compared with the patients in the other two groups. Perry et al. (2010) used a similar sample and utilized the same type of environment as Minassian et al. (2010). They reported that patients with mania and schizophrenia walked more than normal controls.

Some authors contest the traditional hierarchical position of mood changes as the most important for the diagnosis of a manic episode. Others challenge whether mania must present euphoria or irritability, as indicated by the DSM-IV diagnostic criteria (APA, 1994) and which are not different in the DSM-V (APA, 2013).

In this context, Henry et al. (2003) asserted that more important than the tone of mood (e.g., euphoric, irritated, or depressed) in the characterization of mania is the increase in the intensity of emotions, which they called emotional hyperreactivity. They interviewed 30 hospitalized patients at the end of a manic episode. According to retrospective self-report, they found that all of the patients had displayed emotional hyperreactivity. In another study, Henry et al. (2007) evaluated 139 hospitalized patients with bipolar disorder and found that higher levels of emotional hyperreactivity correlated more with the occurrence of manic episodes (i.e., pure or mixed) than with depressive episodes. Additionally, the symptom “sadness” was equally common among patients who presented manic, mixed, or depressive episodes.

Indeed, mood changes other than euphoria or irritability are frequently found in manic episodes. For example, Goodwin and Jamison (2007) reviewed 16 studies and reported that a weighted average of 46% of the patients presented sadness during an episode of mania. In another review of studies of the symptomatology of mania, Cassidy (2010) concluded that anxiety represents a manifestation especially common in mixed mania.

A case report of a mixed-state illustrated the possibility that mania can occur without euphoria or irritability (Cheniaux, 2011). The patient presented several depressive symptoms associated with anxiety and motor agitation. Initially medicated with an antidepressant, the patient did not experience improvement of depressive symptoms or anxiety. Later, the patient reported her symptoms in detail, and psychomotor agitation was clearly associated with a sensation of increased energy and accelerated thinking. Thus, a state designated by Kraepelin (1921) as anxious or depressive mania was identified in the patient. This state is characterized by excessive activity with flight of ideas and anxiety (or depression). When the patient's antidepressant medication was substituted with lithium, the clinical state became a pure depression (i.e. without manic symptoms), which remitted when an antidepressant and atypical antipsychotic were administered concomitantly with lithium. In summary, in this state of atypical or mixed mania, an increase in energy and motor activity was

observed, but the preponderant mood change was anxiety and not euphoria or irritability.

Akiskal et al. (2001) proposed new criteria for the diagnosis of mania, which consist of four items. Item A includes psychomotor activation. Item B includes mood changes represented by at least one of four possibilities: elation, depression, anxiety, and irritability. This diagnostic proposal appears to be more adequate than the DSM-V criteria because it considers increased activity to be the core symptom of mania, which is hierarchically above mood changes and permits the occurrence of mania in the absence of euphoria and irritability.

5. Limitations

Only six manic symptoms were considered in the present study. The use of other scales that evaluate mania, including more items and items that are different from the ones included in the SADS-C, could lead to different results. Additionally, the sample might not be representative because the patients were evaluated while presenting a peak of symptom severity. Therefore, the present results may not be valid for patients with hypomania. Finally, although the IRT analysis is not affected by the effect of the sample, its use presupposes factorial independence. Thus, to understand the dimensional associations of the SADS-C, structural equation models would be ideal.

6. Conclusion

The present results support the hypothesis that increased energy or activity is more important for the diagnosis of mania than mood changes and represents the core feature of the syndrome. Therefore, although the changes in the diagnostic criteria for a manic episode in the DSM-V have represented advances over previous classification versions, these changes could be more extensive.

Role of funding source

This study had no financing.

Conflict of interest

The authors deny conflicts of interest.

Acknowledgment

There are no acknowledgments.

References

- Akiskal, H.S., Hantouche, E.G., Bourgeois, M.L., Azorin, J.M., Sechter, D., Allilaire, J.F., Chatenet-Duchene, L., Lancrenon, S., 2001. Toward a refined phenomenology of mania: combining clinician-assessment and self-report in the French EPIMAN study. *Journal of Affective Disorders* 67, 89–96.
- Akiskal, H.S., Azorin, J.M., Hantouche, E.G., 2003. Proposed multidimensional structure of mania: beyond the euphoric-dysphoric dichotomy. *Journal of Affective Disorders* 73, 7–18.
- American Psychiatric Association, 1994. *Diagnostic and statistical manual of mental disorders*, 4th ed. American Psychiatric Association, Washington, DC.
- American Psychiatric Association, 2013. *Diagnostic and statistical manual of mental disorders*, 5th ed. American Psychiatric Association, Washington, DC.
- Amorim, P., 2000. Mini International Neuropsychiatric Interview (MINI): validation of a short structured diagnostic psychiatric interview. *Revista Brasileira de Psiquiatria* 22, 106–115.
- Bauer, M.S., Crits-Christoph, P., Ball, W.A., Dewees, E., McAllister, T., Alahi, P., Cacciola, J., Whybrow, P.C., 1991. Independent assessment of manic and depressive symptoms by self-rating. Scale characteristics and implications for the study of mania. *Archives of General Psychiatry* 48, 807–812.
- Beigel, A., Murphy, D.L., Bunney, W.E., 1971. The manic-state rating scale: scale construction, reliability and validity. *Archives of General Psychiatry* 25, 256–262.

- Benazzi, F., Akiskal, H.S., 2003. The dual factor structure of self-rated MDQ hypomania: energized-activity versus irritable-thought racing. *Journal of Affective Disorders* 73, 59–64.
- Benazzi, F., 2007. Is overactivity the core feature of hypomania in bipolar II disorder? *Psychopathology* 40, 54–60.
- Birnbaum, A., 1968. Some latent trait models and their use in inferring an examinee's ability. In: Lord, F.M., Novick, M.R. (Eds.), *Statistical Theories of Mental Test Scores*. Addison–Wesley, Reading, MA, pp. 397–479.
- Cassidy, F., 2010. Anxiety as a symptom of mixed mania: implications for DSM-5. *Bipolar Disorder* 12, 437–439.
- Cheniaux, E., 2011. Kraepelin's anxious or depressive mania: a case report. *Revista Brasileira de Psiquiatria* 33, 213–215.
- Embretson, S.E., Reise, S.P., 2000. *Item Response Theory for Psychologists*. Lawrence Erlbaum Associates, Mahwah.
- Endicott, J., Spitzer, R.L., 1978. A diagnostic interview: the schedule for affective disorders and schizophrenia. *Archives of General Psychiatry* 35, 837–844.
- Furlanetto, L.M., Bueno, J.B., 1999. Depression in medical inpatients: validity of the SADS in a Brazilian sample. *Jornal Brasileiro de Psiquiatria* 48, 435–440.
- Goodwin, F.K., Jamison, K.R., 2007. *Manic–Depressive Illness: Bipolar Disorders and Recurrent Depression*. Oxford University Press, Oxford.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., 2009. *Multivariate Data Analysis*, 7th ed. Prentice Hall, New York, NY.
- Henry, C., M'baïlara, K., Desage, A., Gard, S., Misdrahi, D., Vieta, E., 2007. Towards a reconceptualization of mixed states, based on an emotional-reactivity dimensional model. *Journal of Affective Disorders* 101, 35–41.
- Henry, C., Swendsen, J., Van den, B.D., Sorbara, F., Demotes-Mainard, J., Leboyer, M., 2003. Emotional hyper-reactivity as a fundamental mood characteristic of manic and mixed states. *European Psychiatry* 18, 124–128.
- Hirschfeld, R.M., Williams, J.B., Spitzer, R.L., Calabrese, J.R., Flynn, L., Keck Jr., P.E., Lewis, L., McElroy, S.L., Post, R.M., Rappaport, D.J., Russell, J.M., Sachs, G.S., Zajecka, J., 2000. Development and validation of a screening instrument for bipolar spectrum disorder: the Mood Disorder Questionnaire. *American Journal of Psychiatry* 157, 1873–1875.
- Johnson, M.H., Magaro, P.A., Stern, S.L., 1986. Use of the SADS–C as a diagnostic and symptom severity measure. *Journal of Consulting and Clinical Psychology* 54, 546–551.
- Jöreskog, K.G., Sörbom, D., 1996. *LISREL 8.80: User's Reference Guide*. Scientific Software International, Chicago.
- Jöreskog, K.G., Moustaki, I., 2001. Factor analysis of ordinal variables: a comparison of three approaches. *Multivariate Behavioral Research* 36, 347–387.
- Kraepelin, E., 1921. *Manic-depressive insanity and paranoia*. E. & S. Livingstone, Edinburgh.
- Lewine, R.R., Fogg, L., Meltzer, H.Y., 1983. Assessment of negative and positive symptoms in schizophrenia. *Schizophrenia Bulletin* 9, 368–376.
- Loehlin, J.C., 2009. *Latent Variable Model: An Introduction to Factor, Path and Structural Equation Analysis*. Lawrence Erlbaum Associates, Mahwah.
- Minassian, A., Henry, B.L., Geyer, M.A., Paulus, M.P., Young, J.W., Perry, W., 2010. The quantitative assessment of motor activity in mania and schizophrenia. *Journal of Affective Disorder* 120, 200–206.
- Olinio, T.M., Yu, L., Klein, D., Rohde, P., Seeley, J.R., Pilkonis, P.A., Lewinsohn, P.M., 2012. Measuring depression using item response theory: an examination of three measures of depressive symptomatology. *International Journal of Methods in Psychiatric Research* 21, 76–85.
- Perry, W., Minassian, A., Henry, B., Kincaid, M., Young, J.W., Geyer, M.A., 2010. Quantifying over-activity in bipolar and schizophrenia patients in a human open field paradigm. *Psychiatry Research* 178, 84–91.
- Purpura, D.J., Wilson, S.B., Lonigan, C.J., 2010. Attention-deficit/hyperactivity disorder symptoms in preschool children: examining psychometric properties using item response theory. *Psychological Assessment* 22, 546–558.
- Rogers, R., Jackson, R.L., Salekin, K.L., Neumann, C.S., 2003. Assessing axis I symptomatology on the SADS–C in two correctional samples: the validation of subscales and a screen for malingered presentations. *Journal of Personality Assessment* 81, 281–290.
- Samejima, F., 1997. *Graded Response Model*. In: van der Linden, W.J., Hambleton, R.K. (Eds.), *Handbook of Modern Item Response Theory*. Springer-Verlag, New York, NY, pp. 85–100.
- Scientific Software International, 2011. IRTPro (Version 2.1 for Windows Computer Software). Retrieved from: (<http://www.ssicentral.com/irt/downloads.html>).
- Sheehan, D.V., Lecrubier, Y., Sheehan, K.H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., Dunbar, G.C., 1998. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry* 59 (Suppl 20), 22–33.
- Spitzer, R.L., Endicott, J., 1978. *Schedule for Affective Disorders and Schizophrenia: change version*. Biometrics Research, New York Psychiatric Institute, New York, NY.
- Spitzer, R.L., Endicott, J., Robins, E., 1978. Research diagnostic criteria: rationale and reliability. *Archives of General Psychiatry* 35, 773–782.
- Swann, A.C., Lijffijt, M., Lane, S.D., Steinberg, J.L., Moeller, F.G., 2013. Antisocial personality disorder and borderline symptoms are differentially related to impulsivity and course of illness in bipolar disorder. *Journal of Affective Disorders* 148, 384–390.
- Wakschlag, L.S., Choi, S.W., Carter, A.S., Hullsiek, H., Burns, J., McCarthy, K., Leibenluft, E., Briggs-Gowan, M.J., 2012. Defining the developmental parameters of temper loss in early childhood: implications for developmental psychopathology. *Journal of Experimental Child Psychology* 53, 1099–1108.
- World Health Organization, 1993. *The ICD-10 Classification of Mental and Behavioural Disorders: Diagnostic Criteria for Research*. World Health Organization, Geneva.
- Young, R.C., Biggs, J.T., Ziegler, V.E., Meyer, D.A., 1978. A rating scale for mania: reliability, validity and sensitivity. *British Journal of Psychiatry* 133, 429–435.