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**Diagnosing Mania: Improving Self-Assessment Tools Through The Lens of Formal
Psychological Assessment**

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ABSTRACT

Manic episodes can display a wide range of symptoms with significantly varying severities. Broadened comprehension of the symptoms is the core feature of any effective treatment, including bipolar disorder. The aim of this study is to review the key self-rating mania assessment scales in the literature under the light of the theoretical descriptions to enhance understanding of its clinical picture and propose a modified diagnostic tool based on the methodology Formal Psychological Assessment (FPA). FPA can overcome the limitations of current self-report tools related to assessment of mania, by providing qualitative information about the obtained scores and reporting different experiences of the disorder across patients according to response patterns, thereby contributing to improved diagnostic measures and treatment strategies. Lastly, the results of the review are presented as a matrix covering the diagnostic criteria and the FPA approach.

Keywords: Bipolar, manic episode, self-rating scales, formal psychological assessment

INTRODUCTION

Bipolar I disorder is a mental illness, priorly named as manic-depression (Kraepelin & Diefendorf, 2018), that severely disturbs one's well-being and the ability to function due to abnormal changes in their mood and energy. The disorder is characterized by recurrent mood episodes that alternate between mania and depression, although neither a depressive episode nor recurrence of disturbances are a diagnostic requisite (*Bipolar Disorder*, n.d.). However, at least one manic episode is mandatory to classify as bipolar I, making it the core feature of the disorder. The DSM-5 (American Psychiatric Association, 2013) defines manic episodes as a distinct period of significantly and persistently elevated, expansive, or irritable mood with abnormal and consistent increased goal-directed activity or energy, lasting at least 1 week, present most of the time. The symptoms cause remarkable impairment in multiple dimensions of one's being. Nevertheless, the impairment experienced is likely to differ in every individual in terms of severity and variety (Carvalho & Vieta, 2017). Thereby, full comprehension of the differences in symptomatology is crucial for successful interventions.

To start with, one of the most prominent symptoms is an alteration in sense of self. During a manic episode, the individual has a marked magnification in self esteem that does not correspond to their actual capabilities. For example, the sense of grandiosity can be observed as a claim that they are an excellent artist who is capable of composing exceptional music despite their lack of proficiency (Miklowitz, 2019). Along with a surge of extreme confidence, mood, energy levels and goal-directedness increase. The individual can report feeling almost euphoric and full of energy, accompanied with overestimating their abilities, therefore committing to many goals at once. They are likely to purchase various items for different purposes or make far-fetched plans all while irrationally believing that they are going to complete all of them. The elevated mood can be hazardous to the individual and to others since the likelihood of engaging in risky behavior increases (Goodwin & Jamison, 2007). Due to their inflated self esteem and euphoric state, risk evaluation is impaired. A manic person is more likely to gamble, drive under the influence or engage in risky sexual behavior compared to their non-episodic state, as they might perceive themselves 'invincible' (Miklowitz, 2019). However, according to the DSM-5 (American Psychiatric Association, 2013), the mood often tends to be irritable rather than solely euphoric. Behavioral manifestations of irritable mood are frequent especially as a response to rejection of the individual's demands or if substance abuse is present (Swann & Beck, 1999).

Additionally, lability, abrupt changes between euphoria, dysphoria and irritability, is a common trademark of manic episodes. Lability is often accompanied by abnormally affective and disproportionate levels of self expression, portraying an unstable emotional state.

The feature of instability in mania does not only affect the mood domain, but also seen in speech and attention (American Psychiatric Association, 2013). Speech is characterized by being rapid, loud and hypervocal. The fast paced speech is usually hard to interrupt by others and may include content that is irrelevant from the ongoing conversation (Goss, 2006). Individuals tend to jump between different topics as their thoughts are racing. This fast paced thinking reflects in speech as disorganization and incoherency. The speech disturbance can be attributed due to their high distractibility as well, since the individual might struggle to attend to conversations and hold a rational sequence of ideas. Speech is also an area that represents their mood (Goss, 2006); if the mood is expansive, the individual is more likely to use excessive gestures with a theatrical manner. If the mood is rather irritable, the tone tends to be aggressive, regularly coupled with hostile content and attitude.

Another strikingly affected domain in a manic state is sleep as the individual's need for sleep declines dramatically. The reduction in sleep durations are different from insomnia in depressive episodes (American Psychiatric Association, 2013). In insomnia, people feel the need to sleep and the deprivation causes exhaustion, moodiness, decreased attention and lowers daily performance. On the contrary, lack of sleep associated with mania does not affect the individual's performance and they do not report to need sleep. They are active despite sleeping for only a few hours or even not at all (Harvey, 2008). Lastly, psychomotor agitation is a typical occurrence in mania, manifested as senseless physical activities and restlessness such as tipping toes or pacing around a room.

Another crucial point is that manic episodes can be accompanied by depressive or psychotic features, which creates a substantially different experience of mania (Wilting, 2007). For individuals who also meet the criteria for depressive aspects, the diagnosis is 'manic episode, with mixed features'. Identifying the presence of this specifier is clinically important for treatment planning and monitoring treatment response since it is found to be a significant risk factor in the development of bipolar I and II (Frank, 2013). For the diagnosis of psychotic features, hallucinations and delusions should be present, which typically includes themes of grandiosity, invulnerability or paranoia.

When evaluating these behaviors, it is crucial to consider the individual's unique personality and history. All of the above mentioned criteria should be judged in comparison to the person's neutral state, not solely focusing on the assumed episodic behavior but in the context of their prior actions, personality, age and so on (American Psychiatric Association, 2013).

COGNITIVE STRUCTURE OF MANIA

The cognitive aspect of manic episodes can be further understood through Beck's (1969) cognitive triad models. The negative triad model presents that individuals with depressive disorders have a pessimistic view on three dimensions, namely the self, the world and the future. The negative thinking is automatic, spontaneous and not completely under control but accessible to consciousness. To illustrate, people with the negative self perception, can view themselves as worthless, unloveable or hopeless. They also have hardship believing that they can be successful or capable. Pessimism in the world dimension reflects in the individual as overly generalized statements such as 'nobody will ever love me' or 'the world is a cruel place'. The future is also perceived as inopportune and unhappy. According to Beck (1969), the habitual negative interpretations of events and the self is accompanied by dysfunctional cognitive biases that contribute to the course of depression. The cognitive distortions can take the forms of overgeneralizations, arbitrary inferences, personalizations and minimizations. As stated by Beck (1979), mania is the cognitive mirror image of depression:

“Just as depression is characterized by the negative cognitive triad of self, experience and future, mania is characterized by a positive cognitive triad - the self is seen as highly valued and powerful, experience viewed as overly positive and the future is seen as one of unlimited opportunity.”

During a manic state, an individual attends to information in a highly selective manner (Alloy, Abramson, Neeren, et al., 2006): focusing on the one positive aspect of the situation and interpreting an experience solely based on that, coupled with a complete disregard for the negative facets. Additionally, 'all-or-none' thinking and unrealistic optimism disturbs their estimation of consequences as well as their self awareness. They tend to minimize the weight of their mistakes or risky

outcomes of their behavior. This cognitive distortion also interferes with their ability to evaluate efforts needed to complete a task, thereby, results in jumping into projects and behaving impulsively (Beck, 1969).

All in all, manic episodes are characterized by alterations in mood, self perception, sleep, speech, attention and energy, therefore leading to self-destructive behaviors that are encouraged by dysfunctional cognitive biases (Alloy, Abramson, Urosevic, et al., 2005). Precise knowledge of the experience of mania, including all the dimensions in a patient-specific way can provide effective treatment as changes in the above mentioned elements are highly variable between patients.

CLINICAL ASSESSMENT OF MANIC EPISODES

A critical issue has been addressed in the literature regarding the assessment of manic episodes: Can manic patients self-report reliably? There is a common misconception that due to inflated self-esteem and distorted judgment in the episodic state, affected individuals cannot accurately report their symptoms. Platman et al. (1969) supported this view by reporting low correlation between self-rating and clinician rating scales in diagnosing acute mania, leading to a reliance solely on clinician-rated scales and observations. However, more recent studies (Altman et al., 1998; Cooke et al., 1996) have gathered evidence through comparing the scores between multiple self-report scales and observer rated scales in hospitalized patients and showed significant agreement among them, indicating that manic patients can accurately report their symptoms even if they are lacking insight or psychotic features are present. Therefore, utilizing self report tools for diagnosing mania can be highly effective as they can access unique information and eliminate certain biases inherent in observer-rated scales (Hoyt & Kerns, 1999).

Contemporary examinations of manic episodes combine clinical interviews, observations, semi-structured interviews, and self-reports. This combination allows clinicians to obtain detailed information, verify patients' reports, and better understand the needs of the patient (Pope & Lipinski, 1978). While clinical interviews and observations provide thorough descriptions, they are resource-intensive, requiring significant time and trained clinicians. Therefore, self-report tools are frequently used in order to minimize the costs and acquire information about the patient as fast as possible, although the obtained score from these tools

are solely quantitative and not always representative of the unique state of the patient (Beigel & Murphy, 1971). Commonly used self-report tools to assess manic episodes include the Altman Self Rating Mania Scale (ASRM) (Altman et al., 1997), The Internal State Scale (ISS) (Bauer et al., 1991), and Self Report Manic Inventory (SRMI) (Shugar, 1992).

ASRM is a scale that assesses the presence and severity of manic or hypomanic symptoms. The scale consists of 5 items, each relating to one core dimension of mania, namely mood, self confidence, sleep patterns, speech and level of activity (Altman et al., 1997). The items are statements regarding the last seven days and rated on a 5 point scale, to present the frequency and intensity of symptoms. The cut-off score is 6, indicating a considerable probability of mania or hypomania and a need for treatment or further diagnostic work. If the obtained score is five or lower, it implies low likelihood of mania association. ASRM has significant correlation of subscale scores with observer rated scales such as CARS-M and MRS, indicating good concurrent validity (Altman et al., 1997). Moreover, ASRM shows good test-retest reliability as well as sensitivity to change, hence, can be used for tracking the symptoms and evaluating the efficacy of a treatment. Additionally, it can be completed without a clinician being present, either by the patient or the caregiver, since the scale is very brief, it is easy to administer, taking only a few minutes and providing valuable information prior to a clinician visit. However, ASRM alone is not sufficient for diagnosis of bipolar I disorder and it can not detect mixed-features. ASRM should be paired with another tool or clinical interviews in order to achieve a definitive diagnosis and specify features. Finally, ASRM examines the mood only in terms of euphoria, disregarding one of the most common symptoms of mania, irritability, which is observed more frequently than elevated mood (Goodwin & Jamison, 2007).

ISS was developed as a self report scale for longitudinal assessment of manic and depressive symptoms independently (Bauer et al., 1991). Initially 16 items were rated on a visual-analog scale (VAS), however, now it is established that converting to Likert scale maintains the accuracy, allowing fully automated scoring and adaptability to other formats (Glick et al., 2003). Hence, the 100 mm VAS has been substituted with eleven "bins," each representing ranges such as 0-10. Major strength of ISS is the ability to assess mania and depression separately, thereby recognizing mixed features and not assuming that manic states are always euphoric. The scale has 4 subscales as Activation, Well-Being, Perceived Conflict and Depression Index, derived through principal component analysis. Activation scale has

significantly higher scores in manic patients and describes the prominent emotional state when analyzed in conjunction with the Well-Being scale, allowing the discrimination of mood in mania. Bauer and colleagues (Bauer et al., 1991) previously established that the presence of mania could be reliably predicted by a Well-Being score of greater than 125 and an Activation score of greater than 200. However, it should be noted that the Activation scale corresponds to an extensive measure of mania, rather than the whole range of symptoms. The Perceived Conflict, Depression Index and Activation scales provide input regarding symptom severity together. Major weakness of the ISS is that the scale is focused on self perception instead of behavioral outputs such as sleep and speech patterns. Due to absence of emphasis on behavioral domain criteria, ISS is weaker in identifying patients with moderate to severe symptoms of mania (Altman et al., 2001).

SRMI consists of 47 statements to be answered as either true or false, describing the patient's mood and assessing the presence of symptoms relative to the individual's prior state (Shugar, 1992). The tool has 9 subscales covering the DSM-III criteria of mania: thereby, assesses both the behavioral and the affective aspects of the syndrome except the depressive symptoms. SRMI can serve both for diagnostic and tracking purposes and has the ability to reflect symptom improvement over-time as well as drug responsiveness (Bräunig et al., 1996). Additionally, Cooke and his colleagues (Cooke et al., 1996) found SRMI to have high correlation with the observer-rated scale for mania, YMRS (Young, Biggs, Ziegler, & Meyer, 1978), which also serves as an external validator for the tool. On the other hand, when compared with CARS-M, another observer-rated scale, SRMI showed no correlation for baseline scores (Altman et al., 2001). This discrepancy potentially can be attributed to items related to restricted behaviors such as alcohol consumption. Individuals are likely to underreport prohibited behaviors, especially in an inpatient setting, making the scale vulnerable to underestimations of symptom range and severities (Bräunig, Shugar, & Krüger, 1996).

FORMAL PSYCHOLOGICAL ASSESSMENT

Psychological assessment is a challenging matter in terms of methods, tools and resources as clinicians either have to use a lot of resources to gain better understanding of the patient's state or have to trade some benefits for costs of methods. More precisely, clinical interviews and observations require a lot of time and potentially introduce the clinician's bias.

Semi-structured interviews also have similar drawbacks, but they have the benefit of adaptivity as the sequence of questions depends on the previous answers of the patient. Self-report questionnaires examine constructs related to a psychopathology on a quantitative level that does not necessarily always account for qualitative information. However, self-report tools are routinely used, since they allow quick and systematic acquiring of information and potentially mitigate the discomfort of face-to-face interviews for some people (Shapiro, 1951; Fava et al., 2004).

A new methodology called the 'Formal Psychological Assessment (FPA)' has been developed to overcome the limitations of conventional assessment techniques and maximize the benefits of semi-structured interviews and self-report tools (Serra et al., 2015). FPA provides qualitative and quantitative information simultaneously. This is achieved through its structure, which enables the analysis of the relationships between items in a tool. Each item in a questionnaire, presented as a statement to be evaluated by the patient, is called an 'object,' and each object investigates one or more diagnostic criteria, termed 'attributes'. The formal link between objects and attributes are formed using 'Knowledge Space Theory (KST)' (Doignon & Falmagne, 1985) and 'Formal Content Analysis (FCA)' (Ganter & Wille, 1999) (Spoto et al., 2018). To further explain, KST constructs maps on how an object relates to the presence or absence of a symptom, while FCA identifies meaningful clusters that highlight patterns of significant diagnostic configurations (Spoto, Stefanutti, & Vidotto, 2010). Formal Content Analysis and Knowledge Space Theory provides the theoretical underpinnings for FPA, enabling a systematic analysis of how questionnaire items relate to diagnostic criteria (Spoto, Nucci, Prunetti, & Vicovaro, 2023).

Structurally, objects are placed on rows and attributes on columns, creating a Boolean matrix with binary values assigning each item to its specific set of diagnostic criteria (Serra et al., 2017). Assignment of each item to an attribute, illustrated by the matrix, constructs a deterministic model. A deterministic approach produces consistent results, hence, they are clear, simple, and reproducible: same input will lead to the same exact result. However, in order for a deterministic model to be sufficient by itself, the underlying mechanism of a psychopathology should be fully understood, which is not the case for many disorders. Furthermore, they do not account for possible errors and do not consider the fact that not every clinical state has the same probability of occurring. As a consequence, a probabilistic model is required to have an accurate description of a psychopathology (Spoto et al., 2013).

Probabilistic models are flexible and less prone to oversimplification than deterministic models since they incorporate random variation and uncertainty to predict phenomena. By including components to capture variability such as error components, random effects and parameter estimation, probabilistic constructs generate realistic and flexible results while being more complex and intensive. This is obtained by incorporating the 'Basic Local Independence Model (BLIM)' (Doignon & Falmagne, 1999), which is a probabilistic model that assigns probability values to different clinical states. In BLIM, responses to each item are locally independent (Falmagne & Doignon, 2011), based on the subject's clinical state. The probability of a response pattern is determined by the conditional probability, which is influenced by the false negative and false positive rates for each item. Consequently, FPA achieves a deterministic framework that is available for implementation of probabilistic adaptive procedures which mimics a semi-structured interview in the form of a questionnaire.

FPA assures a detailed examination of particular response patterns through an a priori analysis of clinical elements. The clinical elements are represented by attributes, and as the patient responds affirmatively to some of them and not the others, a unique subset of attributes are highlighted, called the 'clinical state' (Serra et al., 2015). Each clinical state endorsed by the patient reveals a precise pattern of responses, thus, allows discrimination between different configurations of disorders (Spoto et al., 2013), in this case mania, even if the obtained numeric score is the same. Moreover, the accuracy of the reported clinical states are supported by the 'prerequisite relation', which refers to a hierarchical dependency between items, where one item is required in order for another item to be present (Serra et al., 2015). For instance, *item x* referring to *attribute a* is required for *item y* to be present, which endorses both *attributes a* and *b*. So, affirmation of item *y* indicates the occurrence of both attributes whilst rejection of item *x* disables the presence of item *y* (Donadello et al., 2016). In FCA, these relations are visualized in a lattice-like structure where nodes represent the sets of items and edges represent prerequisite relations (Serra, Spoto, Ghisi, & Vidotto, 2017). As a result, this framework based on KST, FCA and a preliminary analysis of clinical elements related to a disorder allows all probable clinical states to be expressed whilst disabling the ones that are not possible through the prerequisite relation (Spoto et al., 2018).

Another significant advantage of FPA is theoretical flexibility (Serra, Spoto, Ghisi, & Vidotto, 2017). The same items can be described by different sets of attributes according to

various frameworks. Each item may investigate multiple attributes, and each attribute can characterize several items.

Traditionally, gaining such depth of knowledge regarding an individual's clinical state involves two processes: either the clinician reads all responses in a questionnaire, which is feasible only if the tool is very brief, or conducts a psychological interview aimed at understanding the particular clinical picture. Both processes provide solutions yet, they are costly and lack standardization, especially when compared to the systematic scoring of questionnaires. FPA, on the other hand, delivers qualitative patient-specific information in a systematic way by expanding on the quantitative score (Serra, Spoto, Ghisi, & Vidotto, 2015). Moreover, with FPA a clinical assessment tool would be easy to administer, similar to a questionnaire, thereby providing speed without solely relying on a score (Bottesi et al., 2014). Additionally, FPA provides the advantage of semi-structured interviews by being adaptable, since it does not adhere to a rigid sequence of questions, the order can differ based on the patient's responses. This adaptability eliminates potential inference errors from the clinician and saves time. FPA goes beyond merely obtaining a score by equipping the clinician with patient-specific details through investigating the implications of response patterns in the diagnosis (Bottesi et al., 2014).

To conclude, Formal Psychological Assessment offers a significant advancement in psychological assessment methods by integrating the strengths of semi-structured interviews and self-report questionnaires while mitigating their limitations. FPA leverages Knowledge Space Theory (KST), Formal Concept Analysis (FCA) and implements prerequisite relation to systematically link questionnaire items to diagnostic criteria, thus enabling a qualitative, and quantitative analysis of a patient's clinical state. Its ability to represent complex diagnostic information through deterministic and probabilistic models ensures both precision and adaptability, making it a robust tool for clinicians. Additionally, theoretical flexibility allows for comprehensive assessment across various frameworks, ensuring nuanced and individualized patient care. Finally, FPA is easy to administer and significantly reduces the time required compared to traditional methods. By applying a structured yet adaptable approach, FPA provides a rapid analysis of the clinical picture while granting the clinician with idiographic and a nomothetic diagnosis simultaneously (Serra et al., 2015).

RESULTS

Accurate assessment of manic symptoms is essential for effective management and treatment of bipolar disorder. The accuracy of self-rating tools can be increased by merging their beneficial features and creating a structure that minimizes their limitations. This chapter compares and integrates the two widely used scales in mania assessment: the Altman Self-Rating Mania Scale (ASRM) and the Internal State Scale (ISS) with the aim of obtaining an improved diagnostic appliance. The outcome of the examination consists of a union of the two scales, improved by the aid of a third scale, Self Report Manic Inventory (SRMI), to strengthen the content and fully cover dimensions of the manic syndrome. Lastly, the chapter presents an adaptation of the outcome to the methodology of Formal Psychological Assessment. The adaptation to FPA provides rapid patient-tailored information from a quantitative score as well as theoretical flexibility, systematization and adaptivity to the tool.

The ASRM consists of 5 questions, answered through 5 items that assign a value, assessing mood, self-confidence, sleep patterns, speech, and activity level over the past week using a 5-point Likert scale. The ASRM demonstrates good validity, reliability, and ease of administration but it is not as detailed as ISS. For instance, the ISS assesses mania and depression separately, acknowledging mixed features, through four subscales: Activation, Well-Being, Perceived Conflict, and Depression Index. Also, ISS evaluates the presence of irritability, a crucial identifier of mania related to the mood domain. It effectively predicts manic episodes but focuses on self-perception rather than behavioral outputs, making it less effective for severe manic symptoms. Therefore, combining ASRM and ISS can create a strong comprehensive tool that covers the behavioral and affective domains and has the ability to assess a broader range of severities of mania.

To merge the tools effectively, first it is fundamental to convert the grammatical structures of statements into phrases that can be evaluated with binary values. ISS already contains items that allow a binary evaluation, such as 'Today I feel energized' from the Well-Being subscale, which can have responses as 'yes-or-no' or '1-0'. The issue of ISS is that the items investigate the current day the patient is taking the questionnaire. Based on DSM-5 criteria, assessing the last seven days has the potential to acquire more precise information. Therefore, the items of ISS will be modified accordingly to better correspond to diagnostic criteria and fit to ASRM. However, questions of ASRM are structured differently. To clarify, the first question represents the mood subscale through five statements that describe the frequency of

feeling euphoric in the last week: ‘I do not feel happier or more cheerful than before’ corresponds to 0, while ‘I feel happier or more cheerful than usual all of the time’ corresponds to 5. Thus, each question on the ASRM, has to be reorganized into single sentences that permit a boolean measurement. Referring to the mood subscale, the five sentences can be fused into an item as ‘I feel happier and more cheerful than usual’. For this aim, the items of each question on ASRM are consolidated into single statements as follows:

Mood Subscale:

- I’ve been feeling happier or more cheerful than usual.

Sleep Subscale:

- I need less sleep than usual.

Self-Confidence Subscale:

- I’ve been feeling more self-confident than usual.

Speech Subscale:

- I’ve been more talkative than usual.

Level of Activity Subscale:

- I’ve been more physically active than usual.

This innovative construction helps in creating a straightforward comparison and integration with the ISS. Therefore, a list of items is achieved as a fusion of ISS and ASRM, in which the statements are modified according to appropriate linguistic structures. Following that, another essential step is to pinpoint the items that investigate the similar constructs and separate the ones that are unique to the tool. In order to create a clear and functional tool that does not over-repeat constructs and fully covers the dimensions of the disorder, mapping the questionnaire’s items into meaningful clusters is necessary. This process involves classifying the items of each scale according to their corresponding attributes, identifying overlaps, and highlighting unique features. By doing this, we can create a unified framework that leverages the strengths of both scales. To obtain the improved framework, items are broken down and reorganized into 24 statements that represent the diagnostic criteria derived from the DSM-5. To start with, the Perceived Conflict subscale is disintegrated into items that can assess both speech, mood and possible presence of psychotic symptoms when combined with ASRM.

Another benefit is that the novel framework allows the evaluation of mood in various ways instead of just considering the euphoria aspect: irritability, euphoria and lability can be reported simultaneously. Moreover, thanks to ISS, the presence of mixed or psychotic features can be detected. The skeleton covers the vast majority of the diagnostic criteria, however, additional items from the SRMI can enhance the tool's investigative power on the behavioral domain since the decreased need for sleep, risk taking behaviors, impulsivity and increased goal-directedness can be further examined with the aim of obtaining a refined score. Table 1 presents the list of items for the innovated prospective tool, acquired from the combination and modifications described above:

| | |
|-----|--|
| Q1 | I've been feeling happier or more cheerful than usual. |
| Q2 | I've been feeling more energized than usual. |
| Q3 | I've been actually feeling great inside. |
| Q4 | I've been feeling like my mood is changeable. |
| Q5 | I've been feeling more irritable than usual. |
| Q6 | I've been feeling more self-confident than usual. |
| Q7 | I've been feeling like a more capable person. |
| Q8 | I've been feeling like I can complete many tasks with ease. |
| Q9 | I've been more impulsive than usual. |
| Q10 | I've been engaging in activities that others might consider risky. |
| Q11 | I've been feeling 'sped-up inside'. |
| Q12 | My thoughts have been racing fast. |
| Q13 | I've been more physically active than usual. |
| Q14 | I've been overactive. |
| Q15 | I've been feeling restless. |
| Q16 | I've been more talkative than usual. |
| Q17 | I've been feeling more argumentative than usual. |
| Q18 | I need less sleep than usual. |
| Q19 | I feel energized despite sleeping only a few hours or less. |
| Q20 | I've been feeling depressed occasionally. |
| Q21 | I've felt like nothing will ever work out for me. |
| Q22 | I've felt as if the world is against me. |
| Q23 | I've felt like other people are out to get me. |
| Q24 | I feel very attractive to many people, more than usual. |

Table 1. List of items acquired from the combination of the pre-existing tools.

Consequently, an inventory of attributes emerged from the list of items based on the combination of scales and addition of SRMI anchored dimensions. The attributes reflect the DSM-5 criteria as the items are based on the symptoms derived from the manual. The 10 attributes for assessing mania are namely Altered mood (A1), Self-confidence (A2), Increased energy(A3), Psychomotor agitation (A4), Sleep (A5), Speech (A6), Attention (A7), Goal-directedness (A8), Depressed features (A9) and Psychotic features (A10). The clusters indicating which items correspond to which attributes are shown in Table 2.

| | |
|----------------------------------|-------------------|
| A1: Altered mood | Q1, Q3, Q4, Q5 |
| A2: Self-confidence | Q6, Q7, Q8, Q24 |
| A3: Increased energy | Q2, Q13, Q14, Q19 |
| A4: Psychomotor agitation | Q13, Q14, Q15 |
| A5: Sleep | Q18, Q19 |
| A6: Speech | Q16, Q17 |
| A7: Attention | Q11, Q12 |
| A8: Goal-directedness | Q7, Q8, Q9, Q10 |
| A9: Depressed features | Q20, Q21 |
| A10: Psychotic features | Q22, Q23 |

Table 2. Items and the corresponding attributes.

Each attribute is associated with specific items, represented by question numbers, that reflect various symptoms of mania. For instance, Altered mood (A1) is assessed by items Q1, Q3, Q4, and Q5, allowing a detailed assessment, recognizing the diverse nature of the mood in mania: euphoria, irritability and lability. Just like Altered mood, Self-confidence (A2) is evaluated in various aspects such as the strong belief in one’s capabilities or the perception of their own attractiveness, which corresponds to items Q6, Q7, Q8, and Q24. Furthermore, the table reveals that some items examine the same attribute, and some attributes are examined by multiple different items. This offers various advantages to the tool like increased diagnostic precision, reduced item redundancy and consistency. Since common items can capture overlapping symptoms that might manifest in multiple attributes, diagnostic precision can be improved. For example, ‘feeling like I can complete many tasks with ease’ (Q8) relates to the attributes 'Self-confidence' and ‘Goal-directedness’ concurrently. Reduced item redundancy helps minimize the number of items in total hence, aids the engagement of patients to the questionnaire. Consistency is obtained since if an item persistently appears in multiple attribute clusters, it underscores its importance and relevance, reinforcing the consistency of the diagnostic criteria. This structured inventory allows for a comprehensive

evaluation of manic symptoms, facilitating the identification and differentiation of specific attributes within the broader symptomatology. The structure described above also lays the foundation for one of the major benefits of FPA, theoretical flexibility.

| Item/ Attribute | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 |
|-----------------|----|----|----|----|----|----|----|----|----|-----|
| Q1 | X | | | | | | | | | |
| Q2 | | | X | | | | | | | |
| Q3 | X | | | | | | | | | |
| Q4 | X | | | | | | | | | |
| Q5 | X | | | | | | | | | |
| Q6 | | X | | | | | | | | |
| Q7 | | X | | | | | | X | | |
| Q8 | | X | | | | | | X | | |
| Q9 | | | | | | | | X | | |
| Q10 | | | | | | | | X | | |
| Q11 | | | | | | | X | | | |
| Q12 | | | | | | | X | | | |
| Q13 | | | X | X | | | | | | |
| Q14 | | | X | X | | | | | | |
| Q15 | | | | X | | | | | | |
| Q16 | | | | | | X | | | | |
| Q17 | | | | | | X | | | | |
| Q18 | | | | | X | | | | | |
| Q19 | | | X | | X | | | | | |
| Q20 | | | | | | | | | X | |
| Q21 | | | | | | | | | X | |
| Q22 | | | | | | | | | | X |
| Q23 | | | | | | | | | | X |
| Q24 | | X | | | | | | | | |

Table 3. Matrix of the relationships between items and attributes.

The matrix represents synthesis of the 3 self-report scales’ adapted to the FPA methodology, achieving a comprehensive novel tool magnifying the benefits of each scale and excelling the diagnostic performance. Application of FPA builds a noteworthy configuration in the matrix: as seen in the Table 3, there are no empty rows or columns. This alignment implies that all of the items are related to the disorder and symptoms irrelevant to measuring mania are not included in the construct. Additionally, this means that all diagnostic criteria are assessed, since each attribute has at least one corresponding item. Next off, it is possible to identify the prerequisite relationships, providing adaptivity to the tool. For example, Q13 (‘I’ve been more physically active than usual’) is a prerequisite of Q14 (I’ve been overactive’). An increase in physical activity necessitates and contributes to an overall state of hyperactivity. An individual might be solely more physically active without considering it as ‘overactive’, however, if a patient is reporting to be overactive, they must have an unusual increase in physical activity. This connection between the two items illustrates a prerequisite relationship

that forms the basis for the tool's adaptability. Similar to a semi-structured interview, individuals are guided to respond to items based on their previous answers, allowing a thorough analysis of the areas that the patient is suffering from. Therefore, incorporating prerequisite relationships into a clinical assessment tool enhances its efficiency and personalization. By recognizing that certain symptoms often precede others, the tool can streamline the assessment process. For instance, if a patient reports experiencing racing thoughts (Q12), the tool can anticipate and directly ask about related symptoms such as increased talkativeness (Q16) or impulsivity (Q9), rather than unrelated symptoms. This approach reduces redundancy and concentrates the assessment on pertinent issues. Furthermore, the tool can tailor the sequence and focus of questions based on the patient's responses. For example, if a patient does not report a prerequisite symptom like needing less sleep, the tool can skip subsequent questions about related experiences, such as feeling energized despite limited sleep. This personalization makes the assessment more relevant and less burdensome, improving the overall patient experience.

To sum up, the integration of the Altman Self-Rating Mania Scale (ASRM), the Internal State Scale (ISS), and the Self Report Manic Inventory (SRMI) into a unified assessment tool provides a comprehensive and robust framework for evaluating manic symptoms in bipolar disorder. By merging these scales, the tool benefits from the strengths of each, offering a detailed assessment across both affective and behavioral domains. The innovative adaptation to the methodology of Formal Psychological Assessment (FPA) allows for a structured and systematic approach that enhances diagnostic precision, reduces redundancy, and maintains consistency while integrating theoretical flexibility to the tool. This flexibility allows for the inclusion of various theoretical perspectives, enabling the tool to adapt to evolving clinical understandings and diagnostic criteria. The tool's ability to assess a wide range of symptoms and severities, ensures a thorough evaluation. The incorporation of prerequisite relationships among symptoms further enhances the tool's adaptivity, enabling a personalized assessment process that is both efficient and patient-centered. FPA's innovative methodology not only improves the relevance and accuracy of the assessment but also reduces the burden on patients, thereby facilitating a more engaging and meaningful diagnostic experience. Overall, this comprehensive and adaptive diagnostic tool holds significant promise for advancing the clinical management and treatment of bipolar disorder, offering valuable insights into the complex symptomatology of mania.

DISCUSSION

The primary objective of this thesis is to develop an integrated self-report assessment tool for the diagnosis of mania, through the lens of Formal Psychological Assessment. Also, this paper highlights the importance of improving self-report scales and their potential to contribute to clinical assessment. Innovated patient-report tools can be economical, fast and can eliminate potential biases inherent to observer-rated scales. For this aim, 3 widely used and validated scales were chosen, namely the Altman Self-Rating Mania Scale (ASRM), the Internal State Scale (ISS), and the Self Report Manic Inventory (SRMI). Then, the strengths and weaknesses of the scales were reviewed to create an outline of areas that need improvement. To specify, ASRM considers mood in terms of euphoria only, which disables the detection of mixed features or the prominent symptom of mania, irritability. Plus, the tool is not so detailed, hence, it can overlook some aspects of the patient's experience. Nevertheless, brevity provides many benefits such as easy administration and high patient engagement. Secondly, ISS is excellent in detecting mixed features, psychotic features and various experiences of mood in mania, including instability. However, since ISS focuses on the internal states of the individual, it inevitably disregards the significance of behavioral outputs, especially in the diagnosis of moderate to severe symptomatology. On the other hand, SRMI examines behaviors in a highly detailed manner, which can provide essential information about the patient experience and symptom severity. But, some items of SRMI are related to restricted behaviors which might lead to underreporting, especially in healthcare facilities.

Moreover, all 3 scales had various weaknesses in common, which are present in any self-report clinical assessment tool: the obtained score is solely quantitative due to the fixed order and relationships among items. Thereby, when patients with completely different disorder experiences obtain the same score, their unique diagnostic configurations are hidden behind a number. This results in either overlooking peculiar information specific to each patient or appliance of other methods in order to reach a better understanding of the clinical cases that are resource-intensive. Unifying the three scales and aligning them with the FPA methodology, therefore, provides magnified benefits derived from each scale while dealing with the drawbacks of self-report tools. Adjustment to FPA enables acquiring patient-specific information through a self-report scale by mimicking semi-structured interviews, having theoretical flexibility and adaptivity while not compromising from easy administration,

systematic scoring, time and other resources. The benefits are assured through its structure based on ‘Basic Local Independence Model’, ‘Knowledge Space Theory’ and ‘Formal Concept Analysis’ which enables the incorporation of a probabilistic framework into the tool. By not being solely deterministic, the FPA adapted tool can account for possible errors and random effects which will produce more realistic and flexible results.

Despite these strengths, several limitations must be acknowledged. The integrated tool, while robust in many aspects, may still face challenges. The first challenge is the uncertainty that modifications intended to incorporate the tools effectively will yield the same results as they did originally. The modifications are changing the structure of sentences from ASRM in order to make them appropriate for binary evaluation, breaking down the Perceived Conflict index to create a more comprehensive tool and incorporating content from SRMI’s items that assess the behavioral domain effectively. It is important to note that the Perceived Conflict subscale may not function as accurately after being broken down into its components. As a result, if a patient responds affirmatively to these items, it only suggests an increased need for further examination in that area, rather than providing a reliable diagnosis about the presence of psychotic symptoms. This issue addresses the main challenge of the paper, the lack of external validation: without doubt, incorporating validated and reliable scales does not necessitate that the outcome will also have the same generalizability and diagnostic performance. Thus, the provisional tool undeniably needs further work aimed at testing its accuracy, validity and reliability. Lastly, the issue reported through the literature about diagnosing mania is that there’s not much evidence of how these tools work when substance abuse is present, which is highly common in bipolar disorder (Altman et al., 1997).

All in all, this thesis presents the development of an integrated self-report assessment tool for diagnosing mania, leveraging the strengths of the Altman Self-Rating Mania Scale (ASRM), Internal State Scale (ISS), and Self Report Manic Inventory (SRMI), while aligning with the methodology of Formal Psychological Assessment (FPA). The integration aims to address the limitations inherent in each scale, such as ASRM's narrow focus on euphoria and ISS's emphasis on internal states at the expense of behavioral outputs. By unifying these tools and incorporating a probabilistic framework, the proposed assessment tool not only enhances the comprehensiveness and specificity of mania diagnosis but also maintains ease of administration and adaptability.

However, the modifications introduced, particularly the restructuring of ASRM's sentence structures and the decomposition of the Perceived Conflict subscale, underscore the need for external validation to ensure the tool's reliability and generalizability. The provisional nature of this tool highlights the necessity for further research and testing, especially in complex cases involving co-occurring conditions such as substance abuse. While the proposed tool represents a promising advancement in the nuanced assessment of mania, its efficacy in real-world clinical settings remains to be established through rigorous validation studies.

CONCLUSION

To summarize, manic episodes in Bipolar I disorder are marked by profound alterations in mood, self-perception, sleep patterns, speech, attention, and energy levels, leading to potentially self-destructive behaviors driven by distorted cognitive biases. The cognitive structure of mania, characterized by an overly positive triad of self, world, and future perceptions, contrasts sharply with the negative triad seen in depressive states, reflecting an intense, unrealistic optimism. Accurate diagnosis and management of mania are crucial due to the variability in symptom expression and the risk of harmful behaviors. Self-report tools, such as the Altman Self-Rating Mania Scale (ASRM), the Internal State Scale (ISS), and the Self Report Manic Inventory (SRMI), play a vital role in the assessment and tracking of manic symptoms. They offer valuable insights into the patient's experience and can complement clinical evaluations to provide a comprehensive understanding of the manic state. While self-report tools can effectively highlight the subjective aspects of mania and track treatment progress, they must be used alongside clinical interviews and observer assessments to ensure a patient-tailored diagnosis followed by a treatment plan.

The result chapter has demonstrated the potential of an integrated assessment tool that combines the strengths of the Altman Self-Rating Mania Scale, the Internal State Scale, and the Self Report Manic Inventory with the methodological advantages of Formal Psychological Assessment. This novel approach offers a structured yet adaptable framework that enhances diagnostic precision, incorporates theoretical flexibility, and reduces redundancy. By providing both quantitative scores and qualitative patient-specific information, the tool supports a nuanced understanding of manic symptoms, facilitating more personalized and accurate clinical interventions. Therefore, the novel framework has the potential to overcome the limitations of conventional assessment techniques. However, the

limitations identified, including challenges in detecting the presence of psychotic features and the need for further validation, highlight the importance of future research to refine and validate these tools. Also, as mentioned in the literature so far, in the context of mania diagnosis through self-report tools is not sufficiently researched when comorbid with substance abuse.

In essence, the integration of self-report tools with Formal Psychological Assessment offers a promising advancement in the diagnosis and management of manic episodes in Bipolar I disorder. By leveraging the strengths of the ASRM, ISS, and SRMI, this novel approach addresses existing gaps and provides a comprehensive framework that enhances diagnostic accuracy and treatment personalization. As research continues to refine and validate these tools, their application is poised to significantly improve clinical outcomes and patient care.

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