Item response theory analysis of the diagnostic criteria for mania: Findings from the 2007 Australian National Survey of Mental Health and Well-Being

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Background

Bipolar disorder is a severe and recurrent condition (Stensland et al., 2007).

In the general population, the lifetime prevalence of bipolar disorder is 3.9% in the U.S (Kessler et al., 2005) and 1.3% in Australia.

Specific lifetime estimates for bipolar I disorder (mania) range from 3.6% in the U.S (Weinstock et al., 2009) to 0.7% in Australia.

Bipolar disorder is challenging to diagnose (Agrawal et al., 2010; Stensland et al., 2008) and consequently patients often receive inappropriate treatment (Hirschfeld et al., 2004).

In cross-sectional epidemiological studies, researchers rely on one-time assessments of manic and depressive episodes.

The psychometric performance of the symptoms is thus of critical importance.

Aims

To evaluate the psychometric properties of the DSM-IV mania symptoms in an epidemiologic sample.

- First investigation of its kind in Australia and only second internationally.

Since mania frequently co-occurs with substance use disorders (SUD), to examine differences in symptom expression between those mania respondents with and without a lifetime SUD.

Method

Sample:

- Analyzes focused on respondents who reported a distinct period of abnormally and persistently elevated, expansive or irritable mood, lasting at least 1 week and who were queried about the 14 mania symptom items (n = 623).

Diagnostic instrument:

- Modified version of the World Mental Health-Composite International Diagnostic Interview (WMH-CIDI, version 3.0).

Analytic plan:

- One-factor model was fit to the data.
- Two-parameter logistic model was used to describe the relationship between responses to the DSM-IV mania symptoms and the underlying latent trait (mania severity).
- IRT likelihood-ratio test for differential item functioning program (IRTLRDF) was used to assess whether the mania symptoms function equivalently for those with and without a SUD.
- Benjamini-Hochberg method was used to adjust p-values and reduce the risk of Type I error.
- Final item parameter estimates were generated.

Results

Study sample characteristics:

- mean age of 34.7 years (S.E., 0.8), 16-60 years
- 50.3% (S.E. 2.7) male
- 55.6% (S.E. 2.9) never married
- 54.4% (S.E. 2.3) have a post-school qualification
- 70.7% (S.E. 2.3) were employed

Analysis plan:

Diagnostic instrument:

- IRT likelihood-ratio test for differential item functioning (DIF).
- Following application of the Benjamini-Hochberg procedure, a statistically significant group difference was identified in the severity parameter for the activities with painful consequences symptom: G² (1, n = 623) = 12.5, p < 0.001

Clinically significant DIF:

This difference was also clinically significant as the DIF exceeded our 0.25 criterion.

Differential item functioning (DIF) contd.:

- Target items (symptoms flagged for DIF): grandiosity, flight of ideas, activities with painful consequences.
- Statistically significant DIF:
- Following application of the Benjamini-Hochberg procedure, a statistically significant group difference was identified in the severity parameter for the activities with painful consequences symptom: G² (1, n = 623) = 12.5, p < 0.001

Differential item functioning contd.:

Differentials between the mania groups with and without a SUD in the probability of endorsing activities with painful consequences:

The activities with painful consequences symptom was endorsed at lower levels of severity (i.e., ICC is displaced to the left), and hence more frequently, by those with a SUD diagnosis than those without a SUD diagnosis.

Item response theory (IRT) analysis:

- Item characteristic curves (ICCs) for the seven mania symptoms in the 2007 NSMHWB.
- Discrimination (a): greatest for grandiosity, lowest for the decreased need for sleep.
- The flight of ideas and distractibility symptoms had similar discrimination parameters indicating redundant psychometric information.
- Severity (b): goal-oriented activities symptom tapped the mild end of the mania continuum.
- Grandiosity symptom fell at the severe end of the continuum.

Through an iterative process, anchor and target items were identified.

Anchor set (symptoms free of DIF):
- Increased need for sleep
- Taillativeness
- Distractibility

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Conclusion

With DSM-5 pending, psychometric investigations of diagnostic symptoms are especially timely.

This study confirmed that a single liability dimension underlies mania symptoms.

It adds to a growing literature conceptualising mental disorders according to a dimensional framework (e.g., Brown & Barlow, 2005).

The mania criteria performed equivalently across those mania respondents with and without a SUD, except for the activities with painful consequences symptom. These data indicate that individuals with a SUD are more likely to endorse this item at lower levels of mania severity.

The findings may be aid clinical diagnostic decision-making and highlight subtle phenomenological differences between mania patients with and without SUD.