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Title

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Permalink

Journal

Psychological Assessment, 25(4)

ISSN

1040-3590

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Publication Date

2013-12-01

DOI

10.1037/a0033975

Peer reviewed

The *7 Up 7 Down Inventory*: A 14-item measure of manic and depressive tendencies carved from the General Behavior Inventory

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Abstract

The aim of this study was to develop and validate manic and depressive scales carved from the full length General Behavior Inventory. The brief version was designed to be applicable for youths and adults, and to improve separation between mania and depression dimensions. Data came from nine studies (two youth clinical samples, aggregate *N* = 738 and seven non-clinical adult samples, aggregate *N* = 1756). Items with high factor loadings on the two extracted dimensions of mania and depression were identified from both data sets, and final item selection was based on internal reliability criteria. Confirmatory factor analyses described the two-factor model's fit. Criterion validity was compared between mania and depression scales, and with the full length GBI scales. For both mania and depression factors, seven items produced a psychometrically adequate measure applicable across both aggregate samples. Internal reliability of the Mania scale was .81 (youth) and .83 (adult) and for Depression was .93 (youth) and .95 (adult). By design, the brief scales were less strongly correlated with each other than were the original GBI scales. Construct validity of the new instrument was supported in observed discriminant and convergent relationships with external correlates and discrimination of diagnostic groups. The new brief GBI, the *7 Up 7 Down Inventory* (7U7D) demonstrates sound psychometric properties across a wide age range, showing expected relationships with external correlates. The new instrument provides a clearer separation of manic and depressive tendencies than the original.

Keywords

bipolar disorder; measurement; self-report; two-dimensional; spectrum

Counter to the label's implication, manic and depressive dispositions of bipolar disorder (BD) have different (rather than opposite) behavioral and genetic correlates (Eisner,

Johnson, & Carver, 2008; McGuffin et al., 2003). The separability of manic and depressive symptoms has been demonstrated across a range of measures, using cross-sectional factor analyses (Solomon et al., 2003; Depue et al., 1981) as well as time series analyses of within-subject variability in symptoms (Johnson et al., 2011). These bi-dimensional models of mania and depression fit well with dimensional models of affect (cf. Carver & Harmon-Jones, 2009; Tellegen, Watson, & Clark, 1999), as well as recent initiatives to consider core dimensions of psychopathology (Sanislow et al., 2010). To understand BD spectrum conditions, conjoint measures of manic and depressive predisposition are therefore required.

There are now several dozen rating scales and checklists for manic symptoms, and several hundred for depression, although fewer with published data in BD (see Johnson, Miller, & Eisner, 2008; Youngstrom, 2007 for review). The most commonly used self-report instrument covering both dimensions is the General Behavior Inventory (GBI, Depue et al., 1981). Consistent with two-dimensional theories of BD, the instrument has two rationally derived scales (Depue, Krauss, Spoont, & Arbisi, 1989; Depue, Krauss, & Spoont, 1987). The GBI was designed to comprehensively capture the range of BD symptoms and their fluctuation across time (Depue et al., 1989). The instrument is therefore long (73 items). The length of the GBI, although a strength for many research purposes, is a barrier to its use in research and clinical settings (Youngstrom, Frazier, Demeter, Calabrese, & Findling, 2008).

The overarching aim of this study was to develop and validate a brief version of the GBI that would maintain core content coverage of the two main scales. Beyond enhancing usability, we sought to make two improvements to the GBI. First, to capture manic and depressive dispositions as distinct components of BD, the new instrument was designed to enhance psychometric separation between these two dimensions. Second, recognizing evidence for continuity between childhood/adolescent symptoms and adult BD (Danielson, Youngstrom, Findling, & Calabrese, 2003; Youngstrom, Birmaher, & Findling, 2008), the instrument was designed to be valid across youth and adult populations.

To develop the brief measure, we analyzed existing data sets containing the full 73-item GBI. Two source studies focused on clinical youth samples and seven focused on non-clinical adult samples. Rather than reproducing the complete factor structure of the GBI in miniature, our objective was to carve two psychometrically sound scales (Desai & Braitman, 2005) measuring manic and depressive tendencies, providing a brief alternative to the two GBI scales routinely used in practice. The psychometric properties of the new instrument were then tested via item response theory and investigation of external correlates.

Methods

To develop the carved depression and mania scales, secondary analyses pooled nine samples: two clinical youth samples and seven non-clinical adult samples (Supplemental Table 1). Of 741 youths, 83 met strict DSM-IV criteria for BD I, and 118 for other bipolar spectrum diagnoses; 266 for unipolar depression, 204 for ADHD or disruptive behavior disorders without comorbid mood disorder, and 67 with a variety of other diagnoses. The median number of Axis I diagnoses per youth was 3.0. The adult samples were largely students, and Supplemental Table 1 shows that adult modal age was early-mid 20s.

General Behavior Inventory (GBI, Depue et al., 1981). The GBI identifies lifetime diagnoses of BD as well as syndromal and subsyndromal affective tendencies in clinical and non-clinical populations (Danielson et al., 2003; Depue et al., 1989). Items cover lifetime propensities to experience depressive symptoms (e.g., "Have you become sad, depressed, or irritable for several days or more without really understanding why?"), and hypomanic symptoms (e.g., "Have there been periods of several days or more when your thinking was

so clear and quick that it was much better than most other people's?"). Responses are rated on a four-point Likert scale ranging from "never or hardly ever" to "very often or almost constantly". The GBI also includes some Biphasic items to capture tendencies for mood states to vary from extremely high to extremely low. Biphasic and Hypomania items are commonly collapsed into a single scale (the Hypomanic/Biphasic, or Mania scale) which prospectively predicts onset of manic episodes (Alloy et al., 2012). The GBI Mania and Depressive scale scores display sound psychometric properties across multiple samples including internal reliability alphas exceeding .90, test-retest reliabilities exceeding .70, strong predictive validity, and adequate convergent and discriminant validity across multiple samples (reviewed in Johnson et al., 2008; Youngstrom, 2007). Exploratory factor analyses typically find two strong factors of depression and hypomanic/biphasic mood, along with various small factors that capture less variance and are not typically scored separately (e.g., Depue et al., 1981; Murray, Goldstone, & Cunningham, 2007).

Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL; Kaufman et al., 1997). The KSADS is a commonly used, well-validated interview for establishing bipolar diagnoses among youth. Youths and primary caregivers completed KSADS interviews in the youth samples. Raters were highly trained and inter-rater reliability was sustained throughout the study (kappa for symptom severity .85 in both samples). Diagnoses were reviewed by either a board certified child psychiatrist or licensed clinical psychologist. Diagnoses conformed to strict DSM-IV criteria for bipolar I, bipolar II, cyclothymic disorder, and bipolar NOS (typically due to insufficient duration of the index hypo/manic episode).

The youth samples included the *Young Mania Rating Scale* (YMRS, Young, Briggs, & Meyer, 1978), which has good inter-rater reliability, correlates with other manic severity measures, and is sensitive to treatment effects; and the *Child Depression Rating Scale – Revised* (CDRS, Poznanski, Miller, Salguero, & Kelsh, 1984) to quantify depressive symptom severity. In the youth samples, the primary caregiver completed the *Parent-report GBI* (P-GBI, Youngstrom, Findling, Danielson, & Calabrese, 2001) and the Internalizing Problems score on the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) about the youth's mood traits, providing a cross-informant perspective.

The *Mood Disorder Questionnaire* (MDQ: Hirschfeld et al., 2000) is a 15-item self-report measure of hypomanic symptoms: 13 yes/no items cover DSM manic symptoms, the 14th item asks about simultaneous occurrence, and the last item rates impairment. We used a threshold of 7 or more symptoms co-occurring at least once (Miller, Johnson, Kwapil, & Carver, 2011). The TEMPS-A measured *Affective Temperaments*, with five rationally derived subscales: Dysthymic, Cyclothymic, Hyperthymic, Irritable, and Anxious Temperament (published alphas from 0.67 to 0.91, Akiskal, Akiskal, Haykal, Manning, & Connor, 2005). Hyperthymic scales differentiate BD from other mood disorders, and Dysthymic temperament predicts the severity of depression within BD (e.g., Karam et al., 2010). The 5-item Satisfaction with Life scale (SWL, Diener, Emmons, Larsen, & Griffin, 1985; Diener, Suh, Lucas, & Smith, 1999) measured *Satisfaction with Life*, as both manic and depressive traits are associated with low life satisfaction (Freeman et al., 2009; Murray & Michalak, in press). BD is associated with an evening chronotype (Wood et al., 2009) and elevated seasonal variation in mood and behavior (Shin, Schaffer, Levitt, & Boyle, 2005). The Morningness-Eveningness Questionnaire (MEQ, Horne & Ostberg, 1976) measured *chronotype*; higher scores indicate greater morningness. The Seasonal Pattern Assessment Questionnaire (SPAQ, Rosenthal, Bradt, & Wehr, 1984) assessed *seasonality*. Creativity has reliable associations with bipolar diagnosis (Murray & Johnson, 2010). The 90-item *Creative Behavior Inventory* (CBI, Hocevar, 1979) quantified creative products generated

during adolescence and adulthood. Respondents rated the frequency of creative behaviors since adolescence on a 4-point scale from "Never" to "5 or more times."

Procedure

The two youth samples consisted of case series recruited from families seeking outpatient mental health evaluations for youths between 5 and 18 years of age at either an academic medical center (both samples) or a community mental health center (more than three quarters of the second sample). The seven adult samples were recruited using availability sampling with snowball techniques (in person and online). After reading a brief description of the study, consenting participants completed a questionnaire package which included the GBI and other measures as described above. All studies had appropriate ethical oversight by institutional review boards and followed approved consent and assent procedures.

Analytic Strategy

Steps in item reduction were: (i) EFAs were conducted separately on the two aggregate data sets, using ML estimation, oblique rotation, and extracting two factors to identify candidate items for the carved scales (Desai & Braitman, 2005), (ii) items ranked in the top 10 for both EFAs ("matched items") were selected, (iii) if Cronbach's alpha failed to meet the criterion of > .7 in both data sets (Nunnally, 1978) additional high loading items in both data sets augmented the scale until the criterion was met. We used IRT to examine the coverage of the levels of the underlying trait, and correlations with the full-length GBI scales as a measure of content coverage. We calculated criterion correlations between the two new scales and a range of convergent and discriminant indicators and compared them with corresponding correlations using the full length GBI scales. Receiver Operating Characteristic analyses quantified the ability of the scales to discriminate cases with bipolar diagnoses from all other cases in the sample, and logistic regression tested the incremental validity of combinations of scales at discriminating diagnostic groups.

Results

Item reduction analyses

The imposed two-factor EFA solution for the 73-item GBI explained 42.4% of variance in the youth sample and 46.2% of variance in the adult sample.

Mania Scale—Among the 10 top-ranked items for the mania factor for the two EFA solutions, five were matched across both samples (Items 30, 38, 43, 46 and 64 from the original GBI). As a set, these five items did not meet the internal reliability criterion (as is typical for scales with few items), and so the next-ranking items were compared across EFAs to identify a further two items with high loadings across both. With the addition of these two items (Items 22 and 31), internal reliability criteria were met and so a seven-item Mania scale was created. In the youth sample, internal reliability of the scale was .81, and the correlation was .85 with the full 28-item Mania scale from the original GBI. In the adult sample, alpha was .83 and the scale correlated .88 with the original Mania scale.

Depression Scale—Seven of the 10 top-ranked items for the depression factor were matched across the two EFA solutions (Items 23, 34, 47, 56, 62, 63 and 73). These seven items met internal reliability criteria, and consequently a seven-item Depression scale created. In the youth sample, internal reliability of this scale was .93 and the correlation with the original GBI depression scale was .92. In the adult sample, the alpha was .95 and the scale correlated .93 with the original GBI depression scale.

IRT Analyses—Samejima's graded response model with the Likert-type items, as well as standard IRT parameterization with dichotomized items, found that the items all showed excellent discrimination, with parameters ranging from .81 (*SE* = .12) for the dichotomized version of Item 43 as an indicator of mania in the adolescent sample to 3.98 (*SE* = .48) for dichotomized Item 63 as an indicator of depression in the adult sample. Items provided excellent coverage in the region that discriminates cases with mood disorder from other participants, with total information curves indicating high information in the range from theta values of 0 to 2 in both the adolescent and adult samples, and for both the depression and mania carved scales.

The new measure comprising these two seven-item scales was named the *7 Up 7 Down Inventory* (see Appendix for layout and instructions).[i] The two scales correlated moderately in both the youth (*r* = .45) and adult samples (*r* = .41). Consistent with the empirically-driven separation of factors in the new brief instrument, corresponding correlations in the original GBI were substantially larger (*r* = .85 and .78 in the youth and adult samples respectively).

Criterion Validity

One form of criterion validity is the ability to discriminate cases into categories matching an important reference standard, such as diagnosis. ROC analyses tested the discriminative validity of the 7 Up 7 Down scales. First, we examined the scales' ability to differentiate cases with mania from cases with no diagnoses. Second, we examined ability to differentiate mania from other diagnoses. These comparisons were based on consecutive case series designs with high rates of diagnoses prone to create false positives, consistent with the most stringent recommendations for evaluating diagnostic tests (Bossuyt et al., 2003; Zhou, Obuchowski, & McLish, 2002). Other mood checklists have been found to differ substantially depending on sample composition (Youngstrom et al., 2006).

When comparing cases with BD to those with no diagnoses, the 7 Up scale earned an AUC of .82, and the 7 Down scale had an AUC of .78 for discriminating any mood disorder from no diagnosis. When conducting more stringent tests comparing cases with BD to those with other clinical diagnoses, the 7 Up 7 Down scales showed significant discriminative validity. The Mania scale discriminated cases with bipolar spectrum diagnoses (regardless of comorbidity) from all other diagnoses (including unipolar depression and ADHD) with an Area Under the Curve (AUC) from Receiver Operating Characteristic analyses of .59, versus the full length Mania scale AUC = .62; the difference was not statistically significant, *z* = 1.77, *p* = .077. The Depression scale discriminated cases with any mood disorder (unipolar or bipolar) from other diagnoses, AUC = .67, performing essentially identically to the full-length Depression scale, AUC = .67, *z* = 0.20, *p* = .840 for the test of difference (all AUCs significant *p*<.0005).

Table 1 reports correlations between the two scales and a range of mood related criteria. Cohen & Cohen's (1983) procedure tested differences between the two scales' associations with each criterion. Convergent correlations were significantly higher than contrasting correlations in seven of the nine cases, supporting discriminant validity. Compared to correlations based on the original GBI Mania and Depression scales, convergent correlations were similar. Discriminant correlations generally were better for the new shorter version than the full length scale (see Table 2). Logistic regression analyses found that the 7 Up scale showed significant incremental validity, improving the prediction of BD diagnoses even after controlling for CBCL Internalizing scores, *N* = 738, *p* = .001. Conversely, the Internalizing score made no unique contribution to the prediction of either bipolar diagnoses or any mood disorder after controlling for the 7 Up and 7 Down scales.

In the pooled adult sample, ROC tested the 7 Up 7 Down scales against the MDQ positive screen. Both scales were highly significant predictors, but as expected, Hanley and McNeil's test showed the Mania scale discriminated more strongly than the Depression scale (AUC = .82 versus .69, z = 4.63, all p < .0005). Corresponding AUCs from the original GBI were comparable (.84 and .73, z = 5.65, all p < .0005). These estimates correspond closely to the "distilled" estimates in the adolescent sample, and also benefit from the monomethod design using self-report for both predictor and criterion.

The 7 Up 7 Down scales demonstrated expected criterion correlations (see Table 2). TEMPS-A Dysthymic temperament had a strong association with the Depression but not the Mania scale; whereas Hyperthymic and Cyclothymic temperament showed moderate relationships to Mania. Consistent with the literature, both Mania and Depression were negatively associated with SWL and Morningness and positively with self-reported seasonal variation in mood. Creativity was significantly associated with both tendencies, as expected. The stronger link with Mania was expected based on previous literature (Johnson et al., 2012). Findings were practically identical using the original GBI Mania and Depression scales.

Discussion

The aim of this study was to develop and validate a brief measure of manic and depressive tendencies from the widely used but unwieldy GBI. Seven mania items and 7 depression items were carved from the 73-item GBI using factor analyses pooling nine samples into two age groups. Item selection ensured the new instrument -- the 7 Up 7 Down Inventory -- would be applicable across a wide range of ages and would optimize discriminant validity between the two correlated dimensions of mania- and depression-proneness, matching the dynamic and phenomenological intent of the original GBI (Depue et al., 1981) and underscoring that mania and depression are multi-faceted and contrasting (rather than opposite) biopsychosocial states.

The new Mania and Depression scales had high internal consistency, strong correlations with the original GBI scales, and good criterion validity-- including good discriminative validity in ROC analyses, expected patterns of convergent and discriminant validity with a broad range of related traits and features, as well as incremental validity beyond a well-established measure of internalizing behaviors. Discriminant validity was better in some analyses due to the reduced correlation between carved versus full length scales. Although BD is defined by the presence of hypo/mania, its course is predominantly depressive (Judd et al., 2003), so both dimensions should be considered in case formulation.

The 7 Up 7 Down was designed and validated for adolescents and adults from 11 to 86 years old. This approach is consistent with growing recognition of BD in adolescence, and the importance of early identification (Berk et al., 2011; Findling et al., 2005). To our knowledge, no previous self-report inventory has been designed to have demonstrable applicability across youth and adult populations. There are some short scales designed to assess manic symptoms among youth. Of most relevance, the PGBI-10M includes 10 items from the parent report version of the GBI that best discriminated between youths with versus without bipolar spectrum diagnoses (Youngstrom, Frazier, et al., 2008), thus focusing only on the manic/biphasic aspect and not the propensity for depression. The parent report versions of the GBI, although possessing excellent psychometric properties themselves, have a much narrower age range of application. Findings suggest that the 7 Up 7 Down Inventory has merit as a brief instrument for measuring two dispositions of the BD phenotype.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Appendix

7 Up 7 Down Inventory

Below are some questions about behaviors that occur in the general population. Using the scale below, select the number that best describes how often you experience these behaviors.

Item		Never or hardly ever	Sometimes	Often	Very often or almost constantly
1.	Have you had periods of extreme happiness and intense energy lasting several days or more when you also felt much more anxious or tense (jittery, nervous. uptight) than usual (other than related to the menstrual cycle)?	0	1	2	3
2.	Have there been times of several days or more when you were so sad that it was quite painful or you felt that you couldn't stand it?	0	1	2	3
3.	Have there been times lasting several days or more when you felt you must have lots of excitement, and you actually did a lot of new or different things?	0	1	2	3
4.	Have you had periods of extreme happiness and intense energy (clearly more than your usual self) when, for several days or more, it took you over an hour to get to sleep at night?	0	1	2	3
5.	Have there been long periods in your life when you felt sad, depressed, or irritable most of the time?	0	1	2	3
6.	Have you had periods of extreme happiness and high energy lasting several days or more when what you saw, heard, smelled, tasted, or touched seemed vivid or intense?	0	1	2	3
7.	Have there been periods of several days or more when your thinking was so clear and quick that it was much better than most other people's?	0	1	2	3
8.	Have there been times of a couple days or more when you felt that you were a very important person or that your abilities or talents were better than most other people's?	0	1	2	3
9.	Have there been times when you have hated yourself or felt that you were stupid, ugly, unlovable, or useless?	0	1	2	3
10.	Have there been times of several days or more when you really got down on yourself and felt worthless?	0	1	2	3

Item		Never or hardly ever	Sometimes	Often	Very often or almost constantly
11.	Have you had periods when it seemed that the future was hopeless and things could not improve?	0	1	2	3
12.	Have there been periods lasting several days or more when you were so down in the dumps that you thought you might never snap out of it?	0	1	2	3
13.	Have you had times when your thoughts and ideas came so fast that you couldn't get them all out, or they came so quickly that others complained that they couldn't keep up with your ideas?	0	1	2	3
14.	Have there been times when you have felt that you would be better off dead?	0	1	2	3

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Table 1

Convergent and discriminant validity of the 7 Up and 7 Down Scales (N = 738 outpatient youths)

Measure	7 Up 7 Down		t-test of differences (735 df)	Full length Hypomanic-Biphasic (28 items)	Depression (46 items)	t-test of differences (735 df)	Cronbach's α
	Mania	Depression					
Expected to be more associated with mania							
Adolescent GBI-BH28	**.85****	.71**	8.42**	1.00	.85**	n/a	.93
Parent GBI- BH28	**.16****	.15**	0.34^{ns}	.19**	.16**	1.56^{ns}	.96
YMRS	**.20****	.11**	2.48*	.23**	.13**	4.80**	.86
Bipolar Dx	**.16****	.10*	1.52^{ns}	.19**	.11**	4.19**	n/a
Expected to be more associated with depression							
Adolescent GBI-Dep46	.60**	**.96****	19.69**	.85**	1.00	n/a	.97
Parent GBI-Dep46	.10*	**.27****	4.78**	.16**	.24**	3.87**	.98
CBCL Internalizing *T*	.14**	**.27****	3.25**	.23**	.30**	3.50**	.88
CDRS-R	.12**	**.41****	8.26**	.22**	.39**	9.32**	.90
Any Mood Dx	.12**	**.28****	4.21**	.20**	.27**	3.80**	n/a

Note.

GBI-BH28 = 28 item Mania GBI scale, Adolescent self-report; Parent GBI-BH28 = 28 item Hypomanic/Biphasic GBI scale, Parent report; YMRS = Young Mania Rating Scale total score; Bipolar Dx = Any bipolar spectrum diagnosis based on KSADS interview, yes/no; GBI-Dep46 = 46 item Depression GBI scale, Adolescent self-report; Parent GBI-Dep46 = 46 item Depression GBI scale, Parent report; CBCL = Child Behavior Checklist Internalizing Problems *T* Score; CDRS = Child Depression Rating Scale; Any Mood Dx = any mood disorder diagnosis based on KSADS, yes/no. Cronbach's α estimates based on present sample.

*
p<.05,

**
p<.005, two-tailed; entries with ** remain significant after Holm's stepdown Bonferroni correction.

Table 2

Criterion correlations between 7 Up 7 Down scales and external validation measures in the adult samples

Measure	7 Up 7 Down Mania	7 Up 7 Down Depression	t-test of differences	Full length Hypomanic-Biphasic (28 items)	Depression (46 items)	t-test of differences	Cronbach's α
Expected to be more associated with mania							
TEMPS-Hyperthymic	**.28****	**-.20****	10.48**	.16**	-.15**	9.80**	.71
Creativity	**.48****	**.26****	3.56**	.49**	.36**	3.80**	.93
Expected to be more associated with depression							
TEMPS-Depressive	.18**	**.62****	10.93**	.34**	.59**	9.08**	.81
TEMPS-Anxious	.17**	**.28****	2.28*	.21**	.29**	2.33*	.64
Satisfaction with Life	-.41**	**-.59****	3.50**	-.51**	-.61**	3.07**	.91
Expected to be associated strongly with both mania and depression							
TEMPS-Cyclothymic	**.56****	**.56****	0.13	.73**	.63**	3.99**	.87
TEMPS-Irritable	**.34****	**.33****	0.25	.46**	.38**	2.65*	.74
Morningness	**-.19***	**-.24****	0.79	-.26**	-.27**	0.19	.85
Seasonality	**.22****	**.18***	0.76	.23**	.24**	0.32	--

Note.

Creativity = Creative Behavior Inventory (*N* = 193), TEMPS *N* = 484, Morningness = Horne-Ostberg Morningness Eveningness Questionnaire (*N* = 188), Seasonality = Seasonal Pattern Assessment Questionnaire (*N* = 188). Cronbach's α estimates based on present sample.

*
p < .05,

**
p < .005, two-tailed; entries with ** remain significant after Holm's stepdown Bonferroni correction.