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Short versions of the 32-item Hypomania Checklist (HCL-32): a systematic review

Running head: Screening tools for bipolar disorder

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Conflicts of interest

The authors report no actual or potential conflicts of interest.

ABSTRACT

PURPOSE: Bipolar disorder is frequently misdiagnosed, which leads to negative outcome. The 32-item Hypomania Checklist (HCL-32) is one of the most widely used self-reported screening instruments for hypomanic symptoms, which has several short versions. This systematic review examined the psychometric properties of HCL-32 short versions.

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DESIGN AND METHODS: Five international databases were systematically and independently searched by two researchers for studies that developed HCL short versions. Basic demographic and clinical characteristics, and the psychometric properties of the HCL short versions were recorded.

FINDINGS: Eighteen studies were identified. The majority of the HCL short versions showed satisfactory to good psychometric properties.

PRACTICE IMPLICATIONS: Validated HCL short versions with satisfactory psychometric properties may be helpful for detecting bipolar disorder.

Key words: Bipolar disorder, screening, HCL-32, short versions, systematic review

INTRODUCTION

Bipolar disorder (BD) is a chronic psychiatric illness that is frequently misdiagnosed (Carvalho et al., 2015; Stiles, Fish, Vandermause, & Malik, 2018). Correct diagnosis of BD may take an average of 10 years (Drancourt et al., 2013). Up to 40% of patients with BD are misdiagnosed, usually for major depressive disorder (MDD) (Culpepper, 2014; Phillips & Kupfer, 2013; Stiles et al., 2018). Misdiagnoses lead to

negative consequences, including long untreated periods (Altamura et al., 2015; Medeiros, Senço, Lafer, & Almeida, 2016; Oyffe, Shwizer, & Stolovy, 2015), increased suicide risk (McCombs, Ahn, Tencer, & Shi, 2007) and poor response to antidepressants (Smith, Ghaemi, & Craddock, 2008). It is critical to differentiate BD from other disorders as accurately as possible, particularly from MDD (Vohringer & Perlis, 2016).

With the aid of standardized diagnostic instruments, a more reliable diagnoses could be made, but such assessment is time-consuming and requires a trained clinician (Zimmerman, Posternak, Chelminski, & Solomon, 2004). In contrast, self-reported screening instruments for BD is both time-saving and cost-effective. There are several recent self-reported questionnaires in screening BD, including the 32-item Hypomania Checklist (HCL-32) (Angst et al., 2005), the Bipolar Spectrum Diagnostic Scale (BSDS) (Ghaemi et al., 2005) and the Mood Disorder Questionnaire (MDQ) (Hirschfeld et al., 2000). The HCL-32 was developed to ascertain hypomanic symptoms and bipolar spectrum disorders. The HCL-32 has a two-factor structure (active/elated hypomania and risk taking/irritable hypomania), with reliability from 0.82 to 0.86. It distinguishes between BD and MDD with a sensitivity of 80% and a specificity of 51% (Angst et al., 2005). The HCL-32 has been

cross-culturally validated (Gamma et al., 2013; Meyer et al., 2007; Mosolov et al., 2014; Poon, Chung, Tso, Chang, & Tang, 2012; Yang et al., 2012; Yang et al., 2011).

The length of administering the HCL-32 could still be regarded as a limiting factor for clinical use (Forty et al., 2010). Several HCL short versions have been developed to reduce the length of HCL-32 while maintaining its screening capacity (Forty et al., 2010): for instance, the 16-items version (HCL-16) in the UK (Forty et al., 2010) and 20-items version (HCL-20) in Denmark (Bech, Christensen, Vinberg, Bech-Andersen, & Kessing, 2011). The HCL short versions were developed in different populations using item reduction methods, e.g., exploratory factor analysis, and Mokken analysis. No systematic review of the features of these HCL short versions has been published.

The aim of this systematic review was to summarize the characteristics and the psychometric properties of the short versions of the HCL-32 currently available in the literature.

METHODS

Selection Criteria

This systematic review covers original studies on HCL short versions that were derived from the original HCL-32 (Angst et al., 2005). No restrictions were applied in study settings and samples. Studies published in English and focusing on clinical (primary care, secondary care or inpatients) and non-clinical (general population, community-derived samples) populations were included.

Literature search

The PubMed, Web of Science, EMBASE, PsycINFO and Cochrane Library databases were independently searched from their inception date until June 7, 2018 by two researchers (YYW and DDX). The search words included: ("Hypomania Checklist" OR "Hypomania Checklist" OR "HCL" OR "Hypomania/Mania Symptoms Checklist" OR "Hypomania Symptoms Checklist"). Reference lists of review papers and articles were also hand-searched. Corresponding authors of articles were contacted for additional information if it was necessary.

Data extraction

Two researchers (DDX and YYW) screened the title, abstract and full text of relevant articles and extracted data independently. Any inconsistencies in the above process were resolved by a discussion to reach a consensus. The following information were extracted and tabulated: author, publication year, sample size, study setting, demographic and clinical information of participants, characteristics of the screening instrument, methods used to shorten the HCL-32, the factor structure and items numbers, the overall explained variance, and the validity and reliability of the newly formed instruments.

Quality assessment

Study quality was assessed with the Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) schedule (Whiting et al., 2011). The QUADAS-2 assesses risk of bias in four domains: patient selection, index test, reference standard, and flow and timing. The first three domains also assess concerns regarding applicability c. Two authors (YYW and DDX) independently evaluated the quality of studies. Any disagreement was resolved involving a senior researcher (YTX).

RESULTS

Study characteristics

Altogether, 647 articles were initially identified and eventually 18 studies (n=7,366) that met the study entry criteria were selected for the review (Figure 1). The study sites were: China (3 studies, n=1,665), United States (2 studies, n=967), Spain (2 studies, n=288), United States, Turkey and Chile (1 study, n=188), Russia (1 study, n=389), United Kingdom (1 study, n=389), Italy (1 study, n=563), Iran (1 study, n=163), Demark (1 study, n= 122), Korea (1 study, n=608), Brazil (1 study, n=123), Poland (1 study, n=1,051), Germany (1 study, n=287), and Germany and Sweden (1 study, n=1,103). Seven studies applied the DSM-IV (American Psychiatric Association, 1994), 4 the DSM-IV-R (American Psychiatric Association, 2000), and one study each the ICD-10 (World Health Organization, 1992) and DSM-IV as the diagnostic criteria for BD (Table 1).

Study quality

The details of study assessment with the QUADAS concerning the overall risk of bias and applicability are presented in Supplementary Table 1. The graphic presentation of risk of bias is shown in Supplementary Figure 1.

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Summary of short version of HCL-32 across studies

Eighteen studies that developed a short version of the HCL-32 were identified. Sample sizes ranged from 52 to 1,051. Nine studies reported that their respective HCL-32 short version had dual factor structure, 5 studies found 3-factor structure, 2 studies 4-factor structure, 1 study unidimensional structure, and 1 study did not report factor structure. The item number of short versions ranged from 8 to 31. The overall explained variances ranged from 11.1% to 78%. Two studies reported the reliability of their respective HCL short version (Forty et al., 2010)(Mosolov et al., 2014). The Cronbach's alpha of the HCL-8 and the HCL-16 was 0.71, and 0.77, respectively.

Diverse statistical methods were employed to validate the HCL-32 short versions including confirmatory factor analysis (An, Hong, & Kim, 2011), Mokken analysis (Bech et al., 2011), person measurement with principal components analysis (Court et al., 2014), Receiver Operated Characteristic (ROC) curve (Forty et al., 2010), and Kruskal-Wallis test (Vieta et al., 2007). Only one study reported the sensitivity, specificity, and reliability (0.83, 0.71, and 0.77, respectively) of their shortened version, the HCL-16(Forty et al., 2010). Compared with the original HCL-32 of 0.812 (Forty et al., 2010), the HCL-16 showed a good overall

screening ability with the Area Under Curve of 0.806. Using the optimal cut-off of 8 and above (Forty et al., 2010), the HCL-16 had a positive predictive value of 69.0% and a negative predictive value of 84.4%.

DISCUSSION

A previous systematic review and a meta-analysis only examined the properties of screening tools for BD including HCL-32 (Carvalho et al., 2015; Meyer, Schrader, Ridley, & Lex, 2014). The present one was the first systematic review to summarize the psychometric properties of all short versions of HCL-32 covering most recent studies (Glaus, Van Meter, Cui, Marangoni, & Merikangas, 2018; Hidalgo-Mazzei et al., 2015; Prieto et al., 2015).

The HCL-32 short versions have the advantage to screen BD in busy clinical settings. Two of the several short versions, both the validated and reasonable brief HCL-16 (Forty et al., 2010) and HCL-20 (Bech et al., 2011), seem to be most appropriate for clinical practice and research. While the HCL-28 has satisfactory psychometric properties, but compared to the original HCL-32 it was only slightly shortened (An et al., 2011). Both the HCL-16 (Forty et al., 2010), which was developed in the UK and the HCL-20 (Bech et al., 2011), which originated from

Denmark, have been cross-culturally validated in Korea (Kim, Lee, Kim, & Kim, 2018).

These HCL-32 short versions contained different items resulting in different factor loadings. The discrepancy in factor structures and item loadings across versions are due to different cross-cultural contexts, clinical settings, illness severity, and methods of psychometric analyses. However, factor analyses of the majority of HCL-32 short versions showed a dual structure which was similar to that of the original HCL-32. The dual structure comprises euphoria (increase in energy, self-confidence and activity) and irritable-risk taking (distractibility, risky behavior and lack of self-control) (Vieta et al., 2007).

There are several limitations in this review. First, only English databases were searched. Second, direct comparisons (e.g., validity and reliability) could not be made between the short versions and also between HCL short versions and other screening measures because of inadequate or missing data. Thus, based on this review, firm conclusions could not be drawn on the choice of shortened versions of the HCL-32 for the early identification of BD. Third, evaluation of study quality was not part of the entry criteria, which reduced the comprehensiveness of the

review. Quality assessment found a number of studies biased, which should be considered when choosing a short version.

In conclusion, similar to the HCL-32 most HCL short versions showed a dual factor structure. Validated and cross-culturally validated short versions of the HCL-32, such as the HCL-16 (Forty et al., 2010) and the HCL-20 (Bech et al., 2011), seem to be the preferred choices to facilitate early identification of bipolar disorder.

Implications for Nursing Practice

Mental health resources are insufficient globally. For instance, there are approximately 1.54 million people with BD in China (Zhang et al., 2017), but there were only 27,733 qualified psychiatrists and registrars and 57,591 psychiatric nurses in 2015 (National Health and Family Planning Commission of China, April 7, 2017). Due to limited availability of psychiatrists, and psychiatric nurses in both hospital, community and outpatient settings, reliable, quick, and early identification of patients with BD is crucial. Validated short HCL scales appear to be a time-saving and efficient screening instrument for BD in psychiatric nursing practice.

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Figure 1. PRISMA flow diagram

Table 1. Study characteristics and main findings of the studies included in the systematic review

	Author (year)	References	Country	Setting	Participants N	Mean Age (SD)	Male N (%)	BD Diagnostic Criteria	BD participants (%) BD Types (I/II/NOS)	HC Lit em N	Short en method	Factor structure with item number	Overall explained variance %	Conducted short version Validation
1	Glauss (2018) ^a	(Glauss et al., 2018)	USA	Community	250	NA	NA	DSM-IV	NA	25	EFA with VR	1. "Activity/Increased Energy", 10 items 2. "Distractibility/Irritability", 7 items 3. "Novelty seeking/Disinhibition", 5 items 4. "Substance use", 3 items	11.1%	No
2	Prieto (2015) ^b	(Prieto et al., 2015)	USA, Turkey & Chile	Clinic (outpatients & inpatients)	188	39.8 (12.3)	70 (37.2%)	DSM-IV-TR	BD-I = 46 (25.0%); BD-II = 38 (20.7%); MDD = 100 (54.4%)	30	EFA with VR and MLE	1. "elation-disinhibition-increased goal directed activity" 17 items 2. "risk-taking-impulsivity-substance use" 9 items 3. "distractibility-irritability" 4 items	35%	No
3	Hidalgo-Mazzei (2015) ^c	(Hidalgo-Mazzei et al., 2015)	Spain	outpatient	52	43 (12.99)	20 (38.5%)	DSM-IV-TR	BD = 37 (71.2%); MDD = 4 (7.7%); dysthymic disorder = 7 (13.5%)	18	FA with KVR	1. increased energy, 9 items 2. risk taking or unusual behaviors, 9 items	34%	No

	Author (year)	References	Country	Setting	Participants N	Mean Age (SD)	Male N (%)	BD Diagnostic Criteria	BD participants (%) BD Types (I/II/NOS)	HC Item N	Shorten method	Factor structure with item number	Overall explained variance %	Conducted short version Validation
									); schizoaffective disorder = 4 (7.7%)					
4	Mosolov (2014) ^d	(Mosolov et al., 2014)	Russia	inpatients & outpatients	389	48.2(11)	84 (21.6%)	MINI	RDD = 242 (59.2%); BD-II = 147 (35.9%); BD-I = 20 (4.9%)	8	MLE	NA	NA	No
5	Court (2014)	(Court et al., 2014)	UK	BD patients	389	NA	114 (29.3%)	DSM-IV	BD-I = 340 (87.4%); BD-II = 49 (12.6%)	29	Rasch analysis	broadly unidimensional	35%	Person measurement within PCA
6	Huang (2013)	(Huang, Liu, Feng, Tan, & Ji, 2013)	China	outpatients	1010	38.4(15.1)	430 (42.6%)	MINI	BD = 417 (41.3%), MDD = 593 (58.7%)	22	EFA with KVR.	1. "active/cheerful", 15 items 2. "adventurous/irritable.", 7 items	26.2%	No
7	Perugi (2012)	(Perugi et al., 2012)	Italy	outpatient	563	51(13)	187 (33.2%)	Diagnosis of MDE	Bipolar MDE = 119 (21.1%);	31	EFA with Obliqu	1. 'hyperactive/related', 19 items 2. 'irritable/distractable/im	44%	No

	Author (year)	References	Country	Setting	Participants N	Mean Age (SD)	Male N (%)	BD Diagnostic Criteria	BD participants (%) BD Types (I/II/NOS)	HC Item N	Shorten method	Factor structure with item number	Overall explained variance %	Conducted short version Validation
								DS M-I V.	Non-bipolar MDE= 444 (78.9 %)		rotation	pulsive', 12 items		
8	Yang (2011)	(Yang et al., 2011)	China	outpatient & inpatient	456	36 (12.6)	214 (46.9 %)	DS M-I V	MDD =156 (34.2 %), BD-I= 224 (49.1 %), BD-II =76 (16.7 %)	24	PCA with VR	1. "active/ elated", 13 items 2. "risk-taking", 7 items 3. "irritable", 4 items	38.34 %	No
9	Haghighi (2011)	(Haghighi, Bajoghli, Angst, Holsboer-Trachsler, & Brand, 2011)	Iran	outpatients	163	35.5 (12.4)	84 (51.5 %)	DS M-I V	MDD =61 (37.4%), BD-I =59 (36.2 %), BD-II =43 (26.4%)	22	FA with orthogonal rotation	1. "Positively physically and mentally active", 4 items 2. "Positive social interactions", 9 items 3. "Risky behaviour and substance use", 5 items 4. "Difficulties in social interaction and impatience", 4 items	78 %	No

	Author (year)	References	Country	Setting	Participants N	Mean Age (SD)	Male N (%)	BD Diagnostic Criteria	BD participants (%) BD Types (I/II/NOS)	HCL item N	Shorten method	Factor structure with item number	Overall explained variance %	Conducted short version Validation
10	Bech (2011) ^e	(Bech et al., 2011)	Denmark	outpatient	122	41.5(13.3)	47(38.5%)	DSM-I V & ICD-10	BD-I = 59 (48.4%); MDD = 63(51.6%)	20	PCA without rotation	1.syndrome of active/elevated mood, 10 items 2.syndrome of risk-taking/irritable behaviour, 10 items.	NA	Yes (Mokken analysis)
11	An (2011)	(An et al., 2011)	Korea	inpatients & outpatients	608	42.6(15.7)	198 (32.6%)	DSM-I V or MINI	BD-I =78(12.8%); BD-II =88 (14.5%), BD NOS =44 (7.2%); unipolar disorder=398 (65.5)	28	EFA oblique rotation	1.'elated mood/increased energy', 18 items; 2.'risk-taking behavior/irritability'; 8 items 3. 'increased sexual activity', 2 items	44.0%	Yes (CFA)
12	Soares (2010)	(Soares, Moreno, de Moura, Angst, & Moreno, 2010)	Brazil	Outpatients	123	42(11.1)	21.1%	DSM-I V-T R	BD-I = 37(30%), BD-II = 44 (35.8%), MDD = 42 (34.2%)	27	FA with Scree test and Monte Carlo Parallel ana	1."active/elated" symptoms, 20 items 2."irritable/risk-taking", 7 items	31.54%	No

	Auth or (year)	Refere nces	Co unt ry	Sett ing	Par tici pan t N	Me an Ag e (S D)	Mal e N (%)	BD Dia gno stic Cri teria	BD parti cups (%) BD Types (I/II/N OS)	H C L ite m N	Sh ort en met hod	Factor structure with item number	Ov era ll ex pla ine d var ian ce %	Con duct ed short versi on Valid ation
											lysi s			
1 3	Ryba kows ki (201 0)	(Ryba kowsk i et al., 2010)	Pol and	out pati ent	105 1	46 (11)	29 9 (28 .4 %)	ICD -10 for MD D	non-T RD =482(45.9 %); TRD= 569(5 4.1%)	1 5	EF A wit h obli que rot atio n	1.elevated mood and increased activity, 10 items 2.sexual activity, 2 items 3.irritability, 3 items	66. 9%	No
1 4	Forty (201 0)	(Forty et al., 2010)	Un ite d Kin gd om	Sta ge 1: NA; Sta ge 2: pri mar y car e and sec ond ary car e	Sta ge 1: 582 ; sta ge 2: 135	Sta ge 1: 49. 2, sta ge 2 NA	Sta ge 1; Sta ge 2 NA	DS M-I V	Stage 1: MDD R =322(55.3 %); BD-I =260 (44.7 %); stage 2: BD-I= 28 (20.7 %); BD-II =23 (17%) ; BD-N OS=8 (5.9%); MDD =76 (56.3	1 6	PC A wit h VR	1.'active-elat ed' factor 2. 'risk-taking/ir ritable' factor	34 %	Yes (RO C curv es)

	Author (year)	References	Country	Setting	Participant N	Mean Age (SD)	Male N (%)	BD Diagnostic Criteria	BD participants (%) BD Types (I/II/NOS)	HCL item N	Shorten method	Factor structure with item number	Overall explained variance %	Conducted short version Validation
									%)					
15	Holtmann (2009)	(Holtmann et al., 2009)	Germany	Students (school)	287	17.3 (1.1)	155 (52.7)	Symptoms of "high" based on DSM-I V (not DSM-I V criteria for BD)	NA	20	FA with KVR	1. "active-elated", 7 items 2. "disinhibited/stimulation-seeking", 6 items 3. "irritable-erratic", 7 items	26.1%	No
16	Wu (2008)	(Wu, Angst, Ou, Chen, & Lu, 2008)	China (Taiwan)	outpatients & inpatients	199	35.4 (12.0)	102 (51.3%)	DSM-I V	BD-I=66 (33.2%); BD-II=94 (47.2%); MDD=39 (19.6%)	18	PCA with VR	1. 'active-elated' factor, 13 items 2. 'risk-taking/irritable' factor, 5 items	34.91%	No
17	Meyer (2007)	(Meyer et al., 2007)	Germany	Online version email to university	695	29.2 (8.8)	321 (46.2%)	NA	NA	28	FA with VR	1. 'active-elated' factor, 18 items 2. 'risk-taking/irritable' factor, 10 items	20.8%	No

	Auth or (year)	Refere nces	Co unt ry	Sett ing	Par tici pan t N	Me an Age (S D)	Mal e N (%)	BD Dia gno stic Crite ria	BD parti cipants (%) BD Types (I/II/N OS)	H C L ite m N	Sh ort en met hod	Factor structure with item number	Ov era ll ex pla ine d var ian ce %	Con duct ed short versi on Valid ation
				stu den ts & em ploy ees										
			Sw eden	gen eral pop ulati on	408	55. 5 (12 .6)	21 2 (52 %)	NA	NA	2 9	FA wit h VR	1. 'active-elat ed' factor, 22 items 2. 'risk-taking/ir ritable' factor, 7 items	23. 9%	No
1 8	Vieta (200 7)	(Vieta et al., 2007)	Sp ain	Out pati ents and hea lthy subj ects	236	43. 5(1 1.9)	33. 9	DS M-I V-T R	BD-I= 62 (26.3 %); BD-II = 56; MDD = 58 (23.7 %); health y contro l = 60 (25.4 %);	2 6	FA wit h KV R	1.energy-act ivity, 14 items 2. disinhibition, self-control and attention capacity, 12 items	NA	Krus kal- Walli s ^f

^a250 (96 probands recruited from the community and 154 of their adult first-degree relatives)

^bModified HCL-32: Instead of using the original header ("please try to remember a period when you were in a "high" state; how did you feel then?"), we used a header that asked for the current presence of any of the 32 symptoms included in the scale ('how have you felt in the last week?') The modification would not focus on a lifetime review of symptoms, but rather concurrent symptoms in patients presenting for depression treatment. (reference: Altinbas, K., Ozerdem, A., Prieto, M. L., Fuentes, M. E., Yalin, N., Ersoy, Z., ... & Feeder, S. E. (2014). A multinational study to

pilot the modified Hypomania Checklist (mHCL) in the assessment of mixed depression. *Journal of Affective Disorders*, 152, 478-482.)

^c e-HCL-32 online version

^d original 409 patients with 20 with a change in diagnosis to BD-I were excluded from analysis.

^e Only patients with BD-I were included in the analyses, whereas 10 patients with BD-II were excluded (due to the small number of patients)

^f Short version significantly differed BD patients from MDD and control subjects using Kruskal-Wallis.

Abbreviation: BD = Bipolar Disorders; BD-I = Bipolar I Disorder; BD-II = Bipolar II Disorder; EFA = Exploratory Factor Analysis; FA = Factor Analysis; KVR = Kaiser's Varimax Rotation; MD = Major Depression; MDDR= Recurrent Major Depressive Disorder; PCA = Principal Component Analysis; RDD= Recurrent Depressive Disorder; ROC = Receiver Operated Characteristic; TRD= Treatment Resistant Depression; MINI= Mini International Neuropsychiatric Interview; MLE = Maximum Likelihood Estimation; MLR= Multiple Logistic Regression; N= Number; VR = Varimax Rotation

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