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Screening for major depression in persons with HIV infection: the concurrent predictive validity of the Profile of Mood States Depression-Dejection Scale

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Abstract

Major Depressive Disorder (MDD) is among the most prevalent but underdiagnosed psychiatric disorders in persons with HIV infection. Given the known adverse impact of comorbid MDD on HIV disease progression and health-related quality of life, it is important both for research and for efficient, effective clinical care, to validate existing screening measures that may discriminate between MDD and the somatic symptoms of HIV (such as fatigue). In the current study, we evaluated the concurrent predictive validity of the Profile of Mood States (POMS) Depression-Dejection scale in detecting current MDD in 310 persons with HIV infection. The Structured Clinical Interview for DSM-IV (SCID) diagnosis of MDD and the Cognitive-Affective scale from the Beck Depression Inventory (BDI-CA) served as comparative diagnostic and severity measures of depression, respectively. Results demonstrated that the POMS Depression-Dejection scale accurately classified persons with and without MDD SCID diagnoses, with an overall hit rate of 80%, sensitivity of 55%, specificity of 84%, and negative predictive power of 91% using a recommended cutpoint of 1.5 standard deviations above the normative mean. Moreover, the POMS performed comparably to the BDI-CA in classifying MDD. Findings support the predictive validity of the POMS Depression-Dejection scale as a screening instrument for MDD in persons with HIV disease.

Key words: human immunodeficiency virus, major depression, psychological assessment, screening tests

The prevalence of major depressive disorder (MDD) in HIV infection is significantly higher than that in the general population (Ciesla and Roberts, 2001; Evans et al., 2005), with estimates of current (1 month) MDD in the range of 10% (Cruess et al., 2003) and recent (1 year) at approximately 36% (see, for example, Bing et al., 2001) compared with population prevalences of 5% and 7.6% respectively (Robins et al., 1991; Kessler et al., 1994). Moreover, MDD in HIV has been linked to poorer health-related quality of life, non-adherence to antiretroviral medications (Kemppainen, 2001; Elliott et al., 2002) and increased mortality (Ickovics et al., 2001). Accordingly, the accurate detection and diagnosis of MDD in HIV is a salient issue for effective clinical care (Evans et al., 2005). The gold-standard psychodiagnostic measure in HIV research is the semi-structured clinical interview administered by a trained clinician, for example Structured Clinical Interview for DSM-IV (SCID) (First et al., 1996). For most clinical and research programmes, however, it is not cost- or

time-efficient to perform clinician-administered evaluations for MDD on every person with HIV infection. Individuals are therefore commonly screened for depression using brief questionnaires, with elevated scores being followed up by a more thorough diagnostic evaluation. In this context, low false negative rates are particularly important because neglected MDD diagnoses may result in the omission of critical mental health services, whereas the consequence of false positive errors simply include time and expense burdens resultant from the comprehensive follow-up evaluation.

Self-report measures typically used to screen for MDD in HIV infection include the Center for Epidemiological Studies-Depression Subscale (CES-D) (Radloff, 1977), the Patient Health Questionnaire (PHQ) (Löwe et al., 2004), the Zung Self-Rating Depression scale (Zung, 1965), the Hamilton Rating Scale (HADS) (Hamilton, 1967), and the Beck Depression Inventory-I (BDI) Beck et al., 1961). In HIV, as in other medically ill populations, the assessment of depression symptoms is complicated by the presence of physical complaints common to both depression and illness, including fatigue, weight loss, and sleep disturbance (Norman et al., 1992; Perkins et al., 1995). Accordingly, to reduce the risk of overdiagnoses, exclusion of somatic items from self-report screening measures of depression is commonly recommended when assessing persons with HIV infection or other medical illness (Cavanaugh et al., 1983; Clark et al., 1983; Volk et al., 1993; cf. Aikens, 1999). For example, removal of the last eight items on the BDI-I produces a Cognitive-Affective subscale (BDI-CA) (Beck and Steer, 1993). The validity of the BDI-CA has been supported in several studies of depression in HIV (Castellon et al., 1998; Kalichman et al., 1995; Kalichman et al., 2000).

Another instrument, the Profile of Mood States (POMS) (McNair et al., 1981), is potentially well suited as a screening test for MDD in HIV patients because its assessment of depressed mood does not rely on somatic items. Although this measure is widely used in the assessment of mood in medically ill samples (Piotrowski and Lubin, 1990), including HIV infection (Catalan et al., 1992), few studies have evaluated its predictive validity in relation to rigorously diagnosed MDD. The most recent (Wilkins et al., 1995), using the Diagnostic Interview Schedule (DIS) Version III-A (Robins et al., 1985) as the criterion standard for diagnosis of current major depression reported that a POMS Depression-Dejection raw score cutoff of ≥7 yielded an overall hit rate of 76%, with a sensitivity of 92%, a specificity of 67% and positive and negative predictive values of 61% and 94%, respectively. Despite these promising results, this study has four potential limitations that might restrict its utility and generalizeablity. First, the study was conducted prior to the widespread use of highly active antiretroviral therapy (HAART), which raises concern regarding its generalizability in the present era. This is particularly important because HAART may be effective in reducing the prevalence of depression (see, for example, Starace et al., 2002), which would in turn affect the predictive value of the POMS. Secondly, the study sample was characterized by an extremely high base rate of MDD: one-third of the subjects met DSM-III criteria for current (1 month) MDD, which, as described above, is notably higher than most estimates of the prevalence of MDD in HIV (for example Cruess et al., 2003). Third, it has been argued that in HIV populations clinician-administered instruments like the Structured Clinical Instrument for DSM-IV (SCID) may provide more valid assessment of major depression than do fully structured, lay-administered measures like the DIS (Williams et al., 1991), which rely in part on patient attributions of the aetiology of criterion symptoms. Finally, the authors did not evaluate POMS cutscores derived from published, demographically corrected normative standards. At the time of their study the only available normative standards were those from a healthy college sample and psychiatric outpatients, with the POMS manual providing few interpretative guidelines. More recently, however, healthy adult normative samples have become available (Nyenhuis et al., 1999). This latter point is particularly important because numerous demographic factors (such as sex) have been shown to influence self-report of depressive symptomatology (see, for example, Nyenhuis et al., 1999). As such, informed practitioners and researchers may be more likely to base screening decisions on normative cutscores rather than on raw scores.

The present study further evaluated the predictive validity of the POMS Depression-Dejection subscale as an index of MDD in HIV-infected populations. The primary aim was to assess this measure's predictive ability for identifying current (1 month) MDD where the SCID, a clinician-administered psychodiagnostic research instrument, was the criterion standard. We also sought to assess the classification accuracy of the POMS Depression-Dejection subscale relative to the

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BDI-CA, which is a widely used and well validated self-report measure of depressive symptoms. It was expected that the POMS Depression-Dejection subscale would perform comparably to the BDI-CA, and exploratory analyses will examine the classification accuracy of the two recommended cutoffs in differentiating individuals with and without current MDD.

Method

Participants

Participants included 310 individuals with HIV infection who were enrolled in observational longitudinal studies at the HIV Neurobehavioral Research Center (HNRC), University of California, San Diego. The HNRC cohort and the Center's methods have been described elsewhere in detail (Heaton et al., 1995). In brief, HIV-infected men aged 18–70 years were recruited from clinics and the San Diego community through advertisement and word of mouth. HIV status was determined by enzyme-linked immunoabsorbent assay and confirmed by Western blot. Because the study focused on current MDD, individuals with potentially confounding conditions were excluded:

- active, current alcohol or drug dependence (as determined by the SCID); or
- psychotic disorder (as determined by the SCID); and
- non-HIV related neurological disorder (such as epilepsy).

Written informed consent was obtained after the study was described completely to the subjects. This study was approved by the Institutional Review Board of the University of California, San Diego. Table 1 provides the demographic and clinical characteristics of the sample. In general the sample was composed primarily of middle-aged, high-school-educated, white men. At the time of assessment, 17% of the sample was immunosuppressed (CD4 count < 200), 44% met criteria for an AIDS diagnosis, 57% were prescribed HAART, 3% were prescribed ARVs (antiretrovirals) but no HAART, and 40% were not prescribed any ARVs.

Methods and procedures

All participants completed the SCID, POMS, and BDI-I on the same day as part of a comprehensive evaluation assessing neuropsychological, neuromedical, and psychological functioning. Interviewers administering the SCID were unaware of the results of POMS and BDI-I testing. A SCID diagnosis of current (within the past 30 days) MDD was employed as the primary diagnostic variable. The SCID, a clinician-administered, semi-structured interview using *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) (American Psychiatric Association, 1994) criteria to identify major psychiatric disorders, is frequently used in clinical HIV research. The potential advantage of the SCID over lay-administered measures is that its clinician-administered format permits interviewing to elicit symptoms that otherwise might be underreported, while simultaneously allowing for clinical judgement to evaluate reported symptoms, so that those due to physical illness (such as fatigue) are not unduly weighted in diagnosing a mental disorder. In our study sample 78% of the SCID interviews were administered by staff

Table 1. Demographic and clinical characteristics of the study sample

Variable	Overall (N = 310)	MDD (N = 52)	No MDD (N = 258)
Education[a]	12.7 (2.5)	12.0 (2.5)	12.9 (2.5)
Age	39.7 (9.0)	38.6 (8.3)	39.9 (9.1)
Sex (% male)	88	85	89
Ethnicity (% Caucasian)	66	62	67
Immunosuppressed (%)	17	22	16
AIDS (%)	44	52	42
ARV (%)	60	60	60
HAART (%) (N = 186)	96	100	95

MDD = Major Depressive Disorder; ARV = antiretrovirals; HAART = highly active antiretroviral therapy. [a] $p < 0.05$ (MDD < no MDD).

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clinical psychologists, with the remaining 22% being administered by postdoctoral clinical psychology fellows or advanced clinical psychology doctoral students. Clinicians administering the SCID were trained on administration of the instrument by one of the authors (JHA) – who himself had been certified by the SCID Training Program at the New York State Psychiatric Institute, where the measure was developed. Interviewers were retrained annually, using live and videotape training interviews, and achieved excellent inter-rater agreement on diagnosis of current and lifetime major depression (kappa > 0.9). The prevalence of current MDD in the study sample was 17%, whereas the prevalence of lifetime MDD was 49%.

The POMS is a self-report questionnaire measuring mood states over the past 7 days. The measure consists of 65 adjectives (such as 'hopeless', 'annoyed', 'sluggish') or short phrases ('sorry for things done', 'ready to fight'), which the patient rates on a five-point Likert-type scale (0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely). Typical administration time for the POMS is 10 minutes. The Depression-Dejection subscale is comprised of 15 items, making the range of possible scores on this scale 0 to 60. In healthy samples, the internal consistency of the POMS subscales is satisfactory (Gibson, 1997), and test-retest reliability for the Depression-Dejection subscale has been reported at 0.74 (McNair et al., 1981). Nyenhuis et al. (1999) provides POMS normative data from a standardization sample (N = 400, 48% men) that was age-, gender-, and race-stratified according to 1990 census data. Raw scores were converted to age- and sex-corrected *z*-scores (POMS-*z*) using the published normative data ([raw score – normative mean]/normative standard deviation) (Nyenhuis et al., 1999).

Moreover, each participant completed the BDI-I (Beck et al., 1979). As suggested by Beck and Steer (1993), we employed the Cognitive-Affective subscale as a comparative, well validated self-report measure of depression in our analyses. Moderate depression is indicated by a score greater than 10 on this 13-item subscale. Kalichman et al. (1995) found the BDI-CA subscale to be internally consistent in persons with HIV infection ($\alpha = 0.90$).

Results

The medians and interquartile ranges for the POMS-*z* and BDI-CA in the MDD and non-MDD samples are displayed in Table 2. POMS Depression-Dejection subscale raw scores correlated significantly with the BDI-CA subscale (Spearman's rho = 0.74, $p < 0.0001$). Separate receiver operating characteristic (ROC) curves were conducted to predict a SCID diagnosis of current MDD from the POMS Depression-Dejection subscale (raw and *z*-scores) and from the BDI-CA score. Results were similar for all three measures, with the POMS raw (area under the curve (AUC) = 0.80, SE = 0.04, $p < 0.001$), POMS-*z* (AUC = 0.80, SE = 0.04, $p < 0.001$) and the BDI-CA (AUC = 0.80, SE = 0.04, $p < 0.001$) all performing better than chance in classifying participants with and without MDD.

As shown in Table 3, we obtained descriptive classification accuracy statistics for the POMS Depression-Dejection subscale using cutoff scores of ≥7 (as suggested by Wilkins et al., 1995) and ≥1.5 standard deviations above the mean (as recommended by Nyenhuis et al.,

Table 2. Self-reported symptoms of depression in HIV

Variable	Overall (N = 310)	MDD (N = 52)	No MDD (N = 258)	χ^2	U	p
POMS Depression						
Raw score	9.0 (4.0, 19.3)	26.5 (13.3, 35.8)	7.0 (3.0, 15.3)	47.4	2651.5	<0.0001
z-score[a]	0.2 (−0.4, 1.3)	2.1 (0.6, 3.0)	−0.1 (−0.5, 0.8)	46.7	2680.5	<0.0001
BDI C-A	5.0 (2.0, 11.0)	13.5 (9.0, 17.8)	5.0 (1.0, 8.0)	47.5	2654.5	<0.0001

Data are presented as the median and the quartile range in parentheses. χ^2 values were derived from Wilcoxon Rank Sums tests while U values were generated from the Mann-Whitney U test. [a]data represent *z*-scores (M = 0, SD = 1). MDD = current Major Depressive Disorder; POMS = Profile of Mood States; BDI = Beck Depression Inventory; C-A = Cognitive-Affective subscale.

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1999). As a point of comparison, the same statistics were obtained for the BDI-CA. Using the recommended cutoff score of 1.5 standard deviations above the standardized mean (POMS-*z*), the POMS Depression-Dejection subscale accurately classified SCID diagnoses of MDD, with an overall predictive value of 80%. The raw score cutpoint of ≥7 (POMS-7) yielded an overall predictive value of only 55%. In addition to these previously recommended cutpoints, Table 3 also presents classification accuracy statistics for several additional raw score and *z*-score cutpoints so that users are aware of the associated risks of false positive and false negative errors.

Discussion

Consistent with prior literature (for example, Wilkins et al., 1995), findings from the present study indicate that the POMS Depression-Dejection subscale is an accurate indicator of MDD in individuals with HIV infection. Moreover, POMS Depression-Dejection scores were highly correlated with scores on the BDI-CA subscale, which provides evidence of convergent validity, and performed comparably to the BDI-CA in classifying current MDD in HIV. Using the POMS-*z* cutoff resulted in a higher overall predictive value for the measure than did the POMS-7. Specificity and positive predictive value were also increased with use of the POMS-*z* cutoff, albeit at the cost of a minor decrease in sensitivity. Use of the POMS-7 cut-point with our sample yielded lower specificity, overall predictive value, and positive predictive value than was found by Wilkins et al. (1995). This discrepancy may relate to the lower prevalence of current MDD in our sample (17%), which is nonetheless generally commensurate with recent 1-month prevalence estimates of MDD in HIV (Cruess et al., 2003). The POMS-*z* cutoff resulted in descriptive classification accuracy statistics comparable to the BDI-CA subscale, which in turn was largely consistent with other studies of depression in HIV (Kalichman et al., 1995, 2000).

Our findings suggest that the POMS may serve as an accurate screening measure of depression in persons with HIV infection. Although the recommended cutoff of 1.5 standard deviations above the normative mean (POMS-*z*) demonstrated superior classification accuracy to the POMS-7, clinicians and researchers may wish to use other cutpoints depending on their particular levels of acceptable Type I and Type II error risk (see Table 3). For clinical and research applications in which an elevated score is intended to be followed by a formal psychodiagnostic evaluation, the POMS Depression-Dejection's high negative predictive value (predicting the percentage of individuals with normal POMS scores who do not have MDD) may be of greatest relevance

Table 3. Accuracy of the POMS and BDI in classifying current MDD in HIV

Variable	Sensitivity	Specificity	PPV	NPV	OPV	LR
POMS *z*-scores						
≥1.0	0.67	0.78	0.38	0.92	0.76	3.05
≥1.5	0.55	0.84	0.40	0.91	0.80	3.44
≥2.0	0.52	0.92	0.56	0.91	0.85	6.50
≥2.5	0.35	0.96	0.62	0.88	0.86	8.75
≥3.0	0.23	0.97	0.63	0.86	0.85	7.67
POMS raw scores						
≥7	0.88	0.47	0.24	0.95	0.54	1.66
≥10	0.85	0.58	0.29	0.95	0.62	2.02
≥20	0.64	0.83	0.43	0.92	0.80	3.77
≥30	0.37	0.95	0.61	0.88	0.85	7.40
≥40	0.15	0.99	0.73	0.15	0.85	15.0
BDI-CA						
≥10	0.61	0.80	0.37	0.91	0.77	3.05

PPV = positive predictive value; NPV = negative predictive value; OPV = overall predictive value; LR = likelihood ratio

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because missed diagnoses of MDD due to false negatives may result in an individual not receiving critical mental health services. Note too that, although 'false positive' subjects may not have met full diagnostic criteria on the SCID, this does not necessarily mean that their elevated scores on the POMS Depression-Dejection subscale are not worrisome or do not require further examination. It is possible that, upon further evaluation, some of these false positives may have met diagnostic criteria for dysthymia or a subsyndromal depressive condition. However, dysthmia diagnoses were not available for the current sample.

Although many studies now employ the BDI-Fast Screen (Beck et al., 2000), a seven-item non-somatic subscale of the BDI-II (Beck et al., 1996), we were restricted to an evaluation of the BDI-CA subscale because our participants completed the original BDI-I. It is possible that the BDI-Fast Screen would have performed better than the BDI-CA subscale, and therefore set the bar higher as the gold standard self-report measure of depression. Nevertheless, the POMS-z Depression-Dejection subscale achieved classification accuracy rates comparable to those found with the BDI-Fast Screen in HIV-positive populations (Krefetz et al., 2004). Moreover, the BDI-I may have been more appropriate in the current study because it assesses the same time period as the POMS (the past 7 days), whereas the BDI-II measures depressive symptomology over a 2 week interval. Although the POMS-z and BDI-CA have similar time demands (approximately 5 minutes) and demonstrated comparable classification accuracy, the POMS may be preferable for investigators interested in a broader range of mood states. For example, the POMS contains a Total Mood Disturbance (TMD) score, which has shown preliminary evidence of construct validity in HIV disease (see, for example, Shor-Posner et al., 2003).

It should be noted that the POMS is not recommended for use in isolation as a diagnostic tool. As is the case with other self-report measures, the POMS may not reliably differentiate primary depression from secondary mood disorders such as substance-induced depression. The POMS Depression-Dejection subscale is likely to be most effective when used as a screening device for depression, an index of distress, or as a measure of current affective states. More formal diagnostic evaluations for depression should use all available and relevant resources, including record review, a comprehensive clinical interview and physical examination, as well as validated self-report scales of mood and behaviour. It should be noted that as the current study used a retrospective approach, prospective, longitudinal studies are needed to examine the predictive value of the POMS as a screening and triage instrument in the settings in which it is most likely to be used.

Given the prevalence of MDD in HIV, as well as its often devastating impact on health-related quality of life and disease prognosis, it is important to validate screening measures (such as POMS) that might aid in the identification and treatment of this psychiatric condition. In this regard, the findings of this study support the usefulness of the POMS Depression-Dejection scale as a screening instrument for MDD in HIV. These findings extend prior literature (Wilkins et al., 1995) by providing data on the classification accuracy of the POMS in the HAART era using a clinician-administered gold-standard diagnostic criterion and demographically adjusted normative standards. Avenues of future research might include an exploration of the classification accuracy of the POMS in detecting other prevalent psychiatric disorders in HIV, including Generalized Anxiety Disorder, Dysthymic Disorder, and Bipolar Disorder. It would also be useful to examine the utility of POMS in clinical trials with HIV populations. Finally, the validity of the proposed POMS Depression-Dejection cutoff remains to be explored in more demographically diverse samples of HIV-infected participants.

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