A POMS short form for cancer patients: psychometric and structural evaluation

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Abstract:

The internal consistency, validity, and factor structure of the Shacham shortened version (37 items) of the 65-item profile of mood states (POMS) were examined with a sample of 428 cancer patients who were awaiting bone marrow transplantation. Cronbach's alphas ranging from 0.78 to 0.91 were obtained for each of the six subscales of the POMS-short form (POMS-SF) and for the total 37-item scale. Correlations with the CES-D, the Self-Rated Karnofsky, the MOS SF-20 Physical Functioning, and the Bradburn Positive and Negative Affect Scales provided evidence of the convergent and discriminant validity of the POMS-SF. Results of a confirmatory factor analysis were supportive of the 6-factor interpretation of the POMS items in the 37-item version of the POMS.

Keywords: psycho-oncology | cancer patients | cancer | POMS | bone marrow transplantation

Article:

INTRODUCTION

The profile of mood states (POMS; McNair et al., 1971) was developed to assess transient distinct mood states. The original form of the measure consisted of 65 adjectives that were rated on a 5- point scale from not at all to extremely. Developed on the basis of a series of factor analytic studies (McNair et al., 1971), six factor-based subscales were derived: Tension–Anxiety, Depression– Dejection, Anger–Hostility, Fatigue–Inertia, Vigor– Activity, and Confusion–Bewilderment. A seventh score of Total Mood Disturbance is also calculated by subtracting the score on the one positively scored subscale, Vigor–Activity, from the sum of the other five subscales. McNair et al. (1992) assert that the Total Mood Disturbance score makes clinical sense and can be presumed to be highly reliable because of the intercorrelations among the six primary POMS factors.

A number of studies have reported on use of the POMS to assess psychological aspects of cancer (Weisman and Worden, 1976; Sobel and Worden, 1979; McCorkle and Quint-Benoliel, 1983; Silberfarb et al., 1983; Shacham, 1983; Cassileth et al., 1985; Cella et al., 1989). As multidimensional approaches to the measurement of treatment outcomes and assessment of quality of life of cancer patients have grown in popularity, the use of the POMS to measure the mood disturbance or psychological distress associated with cancer treatment has increased.

There is considerable pressure on those who would like to include a self-report measure of affect or mood as a psychological outcome measure in assessing the effects of treatment to use as brief a scale as possible, in order to reduce respondent burden, as long as it is appropriate for the population being studied and has adequate reliability and validity. The 65-item POMS presents two problems for researchers who want to use it in the measurement of distress in the evaluation of quality of life in cancer patients: (a) its length and (b) the fact that its norms are based on college students and outpatient psychiatric patients (McNair et al., 1971). While the 65-item POMS takes only about 5–7 min for healthy individuals to complete, according to the POMS test manual, patients who are physically ill may require three times as long to complete the instrument, and some patients will have difficulty in completing the test at all (McNair et al., 1971). In an attempt to deal with these problems, Cella et al. (1987) developed an 11-item form of the POMS with a large sample of adult cancer patients, but they did so by giving up the six subscales in favor of a single factor scale of Total Mood Disturbance.

Guadagnoli and Mor (1989) also attempted a revision of the POMS using a sample of cancer patients. They were interested in using the POMS to develop a briefer form that would represent mood in a less complex format. They revised the POMS item set by removing items ‘reflecting somatic content’ and constructed from the remaining items a Negative Affect Scale and a Positive Affect Scale.

Since the 1980s, when these earlier attempts to develop shortened forms of the POMS for use with cancer patients were undertaken, quality-of life assessment based on patient self-report has become a common approach to the evaluation of cancer treatment outcomes. Quality of life (QOL) is generally conceived of as containing both positive and negative dimensions, and the POMS has become one of the favored measures to be included in a battery of measures used to assess quality of life. It offers the advantage of providing six subscale scores plus a total score of disturbance of mood rather than just a global positive–negative index. However, since the POMS is usually included in a battery of measures selected to assess other important dimensions of QOL, a shorter version developed on the responses of cancer patients that retains its internal consistency and still offers the advantage of measuring six mood states that are relevant to changes associated with the impact of cancer is highly desirable.

Shacham (1983) attempted to develop a shorter form of the POMS that retained the six subscales based on responses of cancer patients. Shacham administered the 65-item version of the POMS to 83 cancer patients who were participating in a study focusing on the effectiveness of pain

treatments and developed a 37-item form of the scale based on (a) the contribution of items to the internal consistency (coefficient alpha) of the scale and (b) the face validity of the items in relation to the subscales. It was found that by reducing each of the scales by 2–7 items, internal consistency could be maintained and even improved in two subscales (Confusion and Tension), while cutting the time for completing the scale in half. The validity of this 37-item scale was examined by correlating the shortened scales with the original ones; all correlations were above 0.95. No factor analysis was reported, probably because of the relatively small sample of patients.

Curran et al. (1995) examined the internal consistency and correlation of Shacham's shortened subscales with the original 65-item POMS with a number of patient groups (including 341 cancer patients) and healthy individuals. They found that for all groups, the internal consistency estimates for the POMS-SF subscales were very comparable to those for the original 65-item POMS, and correlations between Total Mood Disturbance and subscale scores on the POMS-SF and the corresponding scores from the original POMS were all greater than 0.95. However, they did not conduct a factor analysis or present validity data.

This paper goes beyond the Curran et al. evaluation of the Shacham shortened version of the POMS by examining the six-subscale structure through a confirmatory factor analysis of a sufficiently larger sample of cancer patients. Neither Shacham nor Curran et al. examined the validity of this short form of the POMS. Therefore, the convergent and discriminant validity of the POMS subscales will also be examined in relation to several other measures of psychological distress and patient functioning.

Regarding convergent validity, it would be expected that the Depression subscale of the POMS should correlate the highest of the POMS subscales with the CES-D, which is a measure of depressive symptoms. The Fatigue and Vigor POMS subscales would be expected to have the highest correlation with the two measures of physical functioning, the MOS Physical Functioning Scale and the Self-Rated Karnofsky, which share a focus on somatic dimensions. The correlation with fatigue, of course, should be negative. The BNAS should correlate positively with the Total Mood Disturbance score and to a lesser extent with the negative subscales. Positive Affect would be predicted to have its highest absolute correlation with the Vigor subscale. With regard to discriminant validity, the four subscales (Anger, Confusion, Depression, and Tension) that deal with somatic aspects of mood should have lower correlations with the MOS Physical Functioning Scale and the Self-Rated Karnofsky Performance Scale.

METHODS

Sample

Four hundred seventy-nine patients awaiting bone marrow transplantation (BMT) who met the study's eligibility criteria were invited to participate; consent and completed study instruments were obtained from 437 (91.2%). These 437 patients were administered the 37-item Shacham

version of the POMS scale along with a number of other quality-of-life measures. In the current study, only results for the 428 cancer patients among the 437 consented subjects are reported.

Fifty-nine percent of the participating cancer patients were male, 90% were White, and 72% were currently married or living with a partner. The group had a mean age of 39.6 yr (range 18–65) and had completed an average of 14.3 yr of education (range 6–25). The majority of patients had been diagnosed with either lymphoma (35%), acute myelocytic leukemia (21%), or chronic myelocytic leukemia (19%). Other diagnoses included Hodgkin's disease (9%) and acute lymphoblastic leukemia (8%).

Questionnaire administration

Informed consent was obtained from patients being evaluated for BMT at The Johns Hopkins Oncology Center to participate in a large prospective cohort study of late toxicities following transplantation, of which this quality-of-life study was a component. An experienced interviewer in a face-to-face contact administered interviews and questionnaires to BMT candidates who were awaiting a final decision about whether they were to receive a transplant. These interviews were conducted before the BMT candidates entered the hospital. Most interviews were conducted in a conference room in a short-term outpatient residence used by the Social Work Department of the Oncology Center. A few interviews were conducted in other out-patient conference rooms. The measures described here were included in a larger questionnaire battery of measures intended to assess baseline psychosocial adjustment and quality of life. The study's procedures were approved by The Joint Committee on Clinical Investigations of The Johns Hopkins University, and all patients gave informed consent for the interviews and questionnaires. Additional demographic and medical data were obtained at the time of the pre-BMT evaluation.

Measures

In addition to the 37-item form of the POMS, other measures that were administered to the 428 cancer patients included the following:

Center for Epidemiologic Studies-depression scale (CES-D): A self-report measure of the frequency of depression rated for the past week (Radloff, 1977). It consists of 20 items for which the respondents are asked to circle a number on a scale of 1–4, with 1 defined as rarely or none of the time (less than one day) and 4 defined as most of the time (5–7 days). A score of 16 or higher has been established as indicative of a need for psychiatric evaluation for clinical depression. The CES-D was developed initially for use in epidemiological surveys with the general population, and its use for screening people for psychiatric symptomatology has been well established (Myers and Weissman, 1980; Roberts and Vernon, 1983). It has also found use in studies of cancer patients as a measure of depressive symptomatology since it has the advantage over other measures of depression of including fewer items asking about physical concerns that might be expected to reflect symptoms of cancer or its treatment rather than

depression (Metzer et al., 1985; Devins et al., 1988; Zonderman et al., 1989; Gritz et al., 1990; Roberts et al., 1990; Ward et al., 1992; Stommel et al., 1993).

Bradburn positive and negative affect scales: A set of 10 self-administered questions (5 for negative affect, 5 for positive affect) developed by Bradburn and Caplovitz (1965), Bradburn (1969) that asks respondents about their recent affective experiences. Intended to be a single measure of psychological well-being, the two 5-item clusters were found to load on orthogonal factors and subsequently have been treated as separate scales (Beiser, 1974; Cherlin and Reeder, 1975). The Bradburn Positive Affect Scale (BPAS) and the BNAS have been shown to be useful measures of psychological well-being for chronically ill patients (Baker et al., 1994).

The MOS SF-20 Physical Functioning Scale: A scale from the Medical Outcomes Study (MOS) 20-item short form (Aaronson et al., 1987) designed at the RAND Corporation (Santa Monica, CA) as a quick (55 min) self-administered questionnaire for use in large-scale patient surveys. Responses range from 1 (all of the time) to 6 (none of the time) regarding how much of the time during the last month the respondents' health has limited them in each of six types of activities they can do, ranging from vigorous activities such as 'lifting heavy objects, running, or participating in strenuous sports' to activities of daily living such as 'eating, dressing, bathing, or using the toilet.'

The Self-Rated Karnofsky performance scale (SR-KPS): A measure of physical functioning for cancer patients developed to provide a self-report version of the classic physician-rated Karnosky scale (Wingard et al., 1991). Patients rate themselves by a 10-point increment from 40 (low-level functioning requiring help) to 100 (high-level functioning requiring no help). In a survey of 70 cancer patients after bone marrow transplantation, the SR-KPS was validated against a physician's ratings using the traditional Karnofsky scale, and statistically significant kappas were obtained (Wingard et al., 1991).

The Cronbach's alphas obtained on these measures in the current study are as follows: CES-D=0.94, Bradburn Positive Affect=0.74, Bradburn Negative Affect=0.59, and MOS SF- 20 Physical Function=0.85. The relatively lower alpha for the BNAs has been observed before (Baker et al., 1996) for this short 5-item scale, but nevertheless the scale has been shown to be a useful measure of the affect dimension of QOL among cancer patients (Coward, 1991).

Statistical analysis

The data were analyzed using SPSS1 for WindowsTM (SPSS, Inc., 1993). A confirmatory factor analysis (CFA) was performed using AMOS (Arbuckle, 1997). The hypothesized model evaluated in the factor analysis was one in which items were assigned to one of six factors that represent the six subscales from the 65-item POMS. For example, unhappy was assigned to the Depression factor and lively was assigned to the Vigor factor.

This data on the POMS was collected as part of a larger study to assess changes in QOL and psychosocial adaptation of BMT recipients over time, and thus it was not the specific purpose at the time to collect measures to test the convergent and discriminant validities of the subscales. Nevertheless, it is possible because of the large number of measures collected to examine some convergent and discriminant correlations with relevant measures.

RESULTS

Table 1 presents a comparison of results of this administration of the Shacham version of the POMS with the results obtained from the original development of this 37-item form of the POMS. The table presents the internal consistency reliability (alpha) coefficients (Cronbach, 1951) and mean scores for the six subscales resulting from our study in comparison with the results reported by Shacham (1983). The reliabilities are quite similar. The mean scores show more difference between the two studies, but this is not unexpected as the patient populations are somewhat dissimilar. Shacham did not report a reliability for the entire 37-item scale or a mean for the Total Mood Disturbance score. In the present study, a Cronbach's alpha of 0.91 was obtained for the 37-item scale; the mean Total Mood Disturbance score was 49.7 (S.D.=18.8).

Table 1. Reliability analysis and subscale means for short-form POMS

POMS scale	No. of items	Baker et al.		Shacham	
		Alpha	Mean score	Alpha	Mean score
Depression	8	0.88	7.04	0.91	9.52
Vigor	6	0.91	12.78	0.87	7.50
Confusion	5	0.78	6.25	0.82	4.95
Tension	6	0.87	10.32	0.80	8.64
Anger	7	0.88	6.44	0.90	4.55
Fatigue	5	0.90	6.80	0.87	8.65

Factor loadings from the confirmatory factor analysis are shown in Table 2. Unlike more traditional analyses, which are evaluated in terms of a single test statistic (e.g., t-test, chi-square, etc.), the fit of a CFA is assessed using multiple indices. AMOS generates a number of commonly reported goodness-of-fit statistics by which to evaluate the appropriateness of a proposed model.

The factor loadings for all items on their proposed subscales are highly significant. Although the chi-square goodness-of-fit statistic is statistically significant (w2=1697, d.f.=614, p50.001), this

is not the best criterion by which to determine the adequacy of the model, as it is sensitive to sample size and may detect trivial discrepancies in fit with moderate to large samples (Bollen, 1989). Other indices seem to indicate that the fit of the proposed model, which preserves the six POMS subscales, is adequate. The relative chisquare statistic of 2.76, which is in the range of a ratio of 2 : 1 or 3 : 1, indicates an acceptable fit (Carmines and McIver, 1981). The root mean square residual (RMR) of 0.07 is slightly higher than the preferred 50.05. The adjusted goodness-of-fit index (AGFI) of 0.77 and the Bentler comparative fit index (CFI) of 0.88 both approach but do not quite meet the level for each, which is indicative of a good fit, 0.8 for AGFI (Cole, 1987) and 0.9 for CFI (Bentler and Bonett, 1980). The root mean square error of approximation (RMSEA) of 0.06, which is between 0.05 and 0.08, indicates an acceptable fit (Browne and Crudeck, 1993). Taken together, these indices indicate that the fit of the proposed model to the data is adequate.

Table 3 shows the intercorrelations of the six subscale scores. The six subscales are highly correlated, a finding which is consistent with the original development of the 65-item POMS (McNair et al., 1971).

Table 2. Factor loadings from confirmatory factor analysis

Subscale/Item	Factor loading
Depression	
Unhappy	0.71
Sad	0.73
Blue	0.81
Hopeless	0.71
Discouraged	0.72
Miserable	0.74
Helpless	0.66
Worthless	0.55
Vigor	
Lively	0.72
Active	0.74
Energetic	0.89

Cheerful	0.68
Full of pep	0.86
Vigorous	0.82
Anger	
Angry	0.75
Peeved	0.76
Annoyed	0.71
Grouchy	0.61
Resentful	0.73
Bitter	0.77
Furious	0.73
Tension	
Tense	0.82
On edge	0.81
Uneasy	0.77
Restless	0.62
Nervous	0.77
Anxious	0.55
Confusion	
Confused	0.74
Unable to concentrate	0.63
Bewildered	0.75
Forgetful	0.47
Uncertain	0.64
Fatigue	

Worn out	0.75
Fatigued	0.85
Exhausted	0.89
Weary	0.71
Bushed	0.84

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Table 4 presents the correlations of the shortform POMS subscales and Total Mood Disturbance scores with other psychosocial measures administered to the study participants. The BNAS alpha is somewhat low, but not inconsistent with the range from 0.48 to 0.73 previously reported in the literature (Cherlin and Reeder, 1975; Warr, 1978). Both convergent and discriminant validity are shown by the patterns of correlations between the scales included in the SF-POMS and the other measures examined. As hypothesized, of the POMS subscales, the CES-D is most highly correlated with the POMS subscale for depression (0.63). It is equally correlated (0.63) with the POMS Total Mood Disturbance scale, which is calculated by adding the scores on the five negative mood scales and subtracting the one positive mood scale (Vigor) from this sum. The other subscales also correlated over 0.40, except for the POMS subscale for fatigue, which is at the 0.34 level. The BNAS shows a similar pattern, with its highest correlation with the POMS Total Mood Disturbance score (0.60) and its lowest correlation with the POMS-Vigor subscale (□0.26). The Positive Affect Scale has its highest correlation with the POMS-Vigor subscale (0.53), and its correlations are negative with the negative subscales and the POMS-Total. As predicted, the MOS Physical Functioning scale has its highest correlations with the Fatigue and Vigor subscale scores. Similarly, the other measure of physical functioning, the Self-Rated Karnofsky, shows its highest correlations with the Fatigue and Vigor subscale scores. This pattern of correlations provides support for the convergent validity of the Shacham POMS-SF. The divergent validity of the Anger, Confusion, Depression, and Tension subscales is supported by the low correlations with the two measures of physical functioning, the MOS Physical Functioning Scale and the Self-Rated Karnofsky.

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DISCUSSION

Shacham (1983) reported internal consistency estimates (Cronbach's alpha) over 0.80 for all six subscales of the shortened form of the POMS. Curran et al. (1995) obtained alphas for the subscales for the six samples of sick and healthy adults they studied that ranged from 0.76 to 0.95, with the lowest alphas obtained for sample scores on the POMS-Confusion subscale. The alphas for two of the subscales in our study were at least 0.90 (Vigor and Fatigue), and all were over 0.80 except for the POMS-Confusion subscale, which had a slightly lower alpha of 0.78.

The internal consistencies of several of the subscales were higher than those for their longer versions in the original POMS. All the alphas obtained in the current study are well within the range recommended by Nunnally and Bernstein (1994) for group comparisons on a scale.

Table 5. Means (S.D.) for SF POMS scales by depression* status

POMS scale/CES-D caseness status	n	Scale Mean	S.D.	t statistic (df)**	P value
POMS total mood disturbance					
Not depressed	265	13.14	15.05	_16.56	
Depressed	147	44.07	19.68	(242)	0.000
POMS anger					
Not depressed	266	4.46	3.55	_10.92	
Depressed	147	10.05	5.63	(212)	0.000
POMS confusion					
Not depressed	266	4.77	3.39	_10.58	
Depressed	147	8.94	4.05	(260)	0.000
POMS depression					
Not depressed	267	4.39	3.17	_14.87	
Depressed	147	11.90	5.66	(198)	0.000
POMS vigor					
Not depressed	267	14.37	4.77	8.81	
Depressed	147	9.98	4.99	(412)	0.000
POMS fatigue					
Not depressed	266	5.63	4.18	_7.41	
Depressed	147	8.85	4.31	(411)	0.000
POMS tension					
Not depressed	267	8.20	4.23	_12.54	
Depressed	147	14.30	4.99	(262)	0.000

*Depression as defined by a CES-D score _16

**Large variations in the numbers of degrees of freedom (d.f.) occur because the assumption of equal variances is not valid for some comparisons.

Data supporting the convergent and discriminant validity of the shortened version of the six subscales and the Total Mood Disturbance score from the 37-item version of the POMS were also obtained. The six POMS subscales and the POMS Total Mood Disturbance were correlated with the CES-D, the MOS SF-20 Physical Functioning, the Self-Reported Karnofsky, and the Bradburn Positive and Negative Affect Scales. The convergent validity correlations between the POMS-Depression and the POMS Total Mood Disturbance scores and the CES-D were the highest at 0.63. The Negative Affect Scale showed positive correlations at 0.44 or over with the negative scales of the POMS, except for the POMS-Fatigue Scale, with which it had a correlation of only 0.34. The POMS-Fatigue scale was only correlated at the 0.34 level with the CES-D as well. These lower correlations may be related to the fact that fatigue is not a major issue for patients at the time they are awaiting bone marrow transplantation and is not strongly related to their degree of depressive symptomatology. The one positive mood subscale of the POMS, the Vigor subscale, had a correlation with the other positive measure, the Positive Affect Scale, of 0.53. The discriminant correlations of the Positive Affect Scale with all the negative mood scales were lower and negative, as one would expect. The low correlation of the Depression, Tension, Anger, and Confusion subscales with the two measures of physical functioning supported the divergent validity of the SF-POMS.

Confirmatory factor analysis, which was not done with Shacham's relatively small sample of cancer patients, produced results that support the six-factor interpretation of the POMS items in the Shacham POMS-SF. The fit of the six-factor (subscale) model to the data is adequate, and the factor loading of each item retained in the shorter scales was highly statistically significant.

There are several aspects of the model fit that lend further support to our conclusion that the fit of the model is reasonable. First, in addition to the RMR being rather small, the residuals are normally distributed. Second, the error terms for the individual items are small and consistent across items. Third, the items are fairly well predicted, with R-squares ranging from 0.22 to 0.78. Fourth, the modification indices produced by AMOS indicate that only small improvements in the fit would result from allowing error terms among the items to covary. Fifth, the variance of items is fairly consistent across items. Finally, inspection of the correlation matrix indicates that correlation among items is in the moderate range (even poor models are relatively easy to fit with low correlations among items).

High correlations between subscales may be a source of lack of fit in the model. However, McNair et al. (1992) have reported that correlations between Tension-Anxiety and the other mood scales tend to be higher in patient groups than 'normal' groups. As the purpose of this

investigation was to test the retention of the original subscale structure in the Shacham POMS-SF, we have not ‘tweaked’ the model in order to obtain a better fit.

A limitation of this study should be noted. Since the sample of cancer patients studied were all BMT candidates, they are somewhat different from many of the groups of cancer patients studied in the literature. For the most part, they were younger and most had critically life-threatening hematologic disease. Accordingly, it will be useful to further examine the performance of the Shacham POMS-SF in other large samples of cancer patients who are older and more diverse in diagnosis and risk status.

In summary, our data on the 37-item short-form of the POMS (POMS-SF) show that this version of the POMS maintains the factor-based sixsubscale structure of the original 65-item version of the POMS. It also maintains or surpasses the level of internal consistency of the subscales of the longer version of this instrument. Correlations with other measures of mood and physical functioning confirm the convergent and discriminant validity of the POMS-SF. Thus, the Shacham POMS-SF, which offers a considerably shorter administration time while retaining the six-subscale structure with cancer patients, provides an acceptable alternative to the original 65-item and the ‘brief ’ 11-item versions. Given the need for outcome measures in the era of managed care, the Shacham POMS-SF can serve as a brief measure of distress following psychosocial interventions, or as one indicator of quality of life following the completion of a variety of cancer therapies.

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