TILBURG ◆ UNIVERSITY

Tilburg University

Positive and negative affect within the realm of depression, stress and fatigue

Denollet, J.K.L.; de Vries, J.

Published in:
Journal of Affective Disorders

Publication date:
2006

Document Version
Publisher's PDF, also known as Version of record

Link to publication in Tilburg University Research Portal

Research report

Positive and negative affect within the realm of depression, stress and fatigue: The two-factor distress model of the Global Mood Scale (GMS)

Johan Denollet *, Jolanda De Vries

CoRPS—Center of Research on Psychology in Somatic diseases, Department of Psychology and Health, Tilburg University, P.O. Box 90153, 5000 LE Tilburg, The Netherlands

Abstract

Background: The Global Mood Scale (GMS; [Denollet, J., 1993a. Emotional distress and fatigue in coronary heart disease: the Global Mood Scale (GMS). Psychol Med 23, 111–121., Denollet, J., 1993b. The sensitivity of outcome assessment in cardiac rehabilitation. J Consult Clin Psychol 61, 686–695.]) was originally developed as a measure of positive affect (PA) and negative affect (NA) in cardiac patients. The purpose of this study was to examine its two-factor affect model in the realm of stress, depression, and fatigue in working adults.

Methods: Affect, stress, depression, and fatigue were assessed with validated questionnaires in a sample of 228 adults (49.6% male; mean=41.4±9 years) from the working population.

Results: The GMS PA and NA scales were internally consistent (Cronbach's α=.94 and α=.93, respectively), and correlated in the expected direction with their corresponding mood scales from the Positive and Negative Affect Schedule (PANAS). Factor analyses of the 40 mood terms comprising the GMS and PANAS yielded one common PA-dimension, but two NA-dimensions reflecting emotional exhaustion (GMS) and anxious apprehension (PANAS) as different components of the stress process. A relatively high mean NA score of the GMS suggested that these working adults perceived terms that refer to malaise/deactivation as being relevant to describe their negative affective status. The GSM-NA scale was related to stress, depression and fatigue while the GMS-PA scale was positively associated with quality of life.

Limitations: This study is based on a cross-sectional design.

Conclusions: The association between the PA (negative correlation) and NA (positive correlation) scales of the GMS and perceived stress, depressive symptoms, and fatigue supports the validity of its two-factor model. Assessment of both PA and NA may benefit a better understanding of emotional distress in adults from the working population.

© 2006 Elsevier B.V. All rights reserved.

Keywords: Positive affect; Negative affect; Depression; Stress; Fatigue; Quality of life

1. Introduction

Apart from their adverse effect on emotional well-being and quality of life, depression, stress and fatigue have also been associated with adverse health outcomes

---

 * Corresponding author. Tel.: +31 13 466 2390; fax: +31 13 466 2370.

 E-mail address: denollet@uvt.nl (J. Denollet).

such as respiratory infections (Cohen et al., 1997), cancer (Penninx et al., 1998), and coronary events (Smith and Ruiz, 2002), respectively. Moreover, research shows that chronic work-related stress can also result in burnout (Taris et al., 1999) or persistent fatigue (Veldhuizen et al., 2003) as indicators of maladaptive functioning. Burnout is more common than generally believed and may adversely affect the individual's functioning, including his/her satisfaction with interpersonal relationships and life in general (Iacovides et al., 2003). Underlying susceptibility for depression, such as personal/familial history of depression, may enhance the risk for professional burnout (Nyklíèek and Pop, 2005). Emotional distress has also been associated with impaired work performance (Haslam et al., 2005). Hence, symptoms of depression, stress and fatigue may be the harbinger of emotional and physical health problems in adults from the working population.

In contrast, little is known of the impact of depression and anxiety on working life (Haslam et al., 2005), including the affective dimensions of distress in this context. Affect refers to subjective moods and feelings rather than thoughts about specific events (Russell and Carroll, 1999). The Global Mood Scale (GMS) is a relatively new mood scale that was initially validated in cardiac patients (Denollet, 1993a). This scale is based on the 2-factor model of negative and positive affect (Reich et al., 2003; Watson and Tellegen, 1985) and was originally developed in men with coronary heart disease (Denollet, 1993a). Initially, a list of 56 mood terms was generated to reflect the two-dimensional model of negative and positive affect (Watson and Tellegen, 1985). Next, mood terms with high endorsement frequency, factor loading and internal consistency were retained; terms with a high loading on both negative and positive factors were removed. The GMS comprises 10 negative and 10 positive mood terms that are commonly reported by non-psychiatric individuals (Denollet, 1993a). The 10 positive mood terms of the GMS are characterized by energy and engagement; e.g., *lively*, *dynamic*. Many individuals may deny negative moods but rather may complain about feelings of malaise/fatigue (Chen, 1986). Therefore, the 10 negative mood terms of the GMS are characterized by feelings of malaise; e.g., *wearied*, *listless*.

A number of studies have confirmed the validity of the GMS in cardiac patients (Bennett et al., 1999; Hevey et al., 2004; Lowe et al., 2000; Thornton and Hallas, 1999). However, as noted by Hevey et al. (2004), the usefulness of the GMS in non-cardiac persons such as adults from the working population has not been examined yet, and information on the relationship between the GMS and the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) is lacking. The present study examined these issues by studying the relationship between mood status and symptoms of depression, stress and fatigue in a non-cardiac sample from the working population, and by validating the GMS against the PANAS as an extant measure of affective mood states (Hevey et al., 2004).

The first aim of the present study was to examine the relationship between the GMS and PANAS measures of affect. The Positive Affect (PA) scales of the GMS and PANAS refer to affective states that are pleasant and activated (e.g., *active*). The Negative Affect (NA) scale of the GMS predominantly refers to deactivation and malaise (e.g., *fatigued, listless*) while the PANAS-NA scale refers to arousal and anxious apprehension (e.g., *upset, scared*). Hence, the GMS-NA and PANAS-NA mood scales, albeit related, may tap different facets of NA. The second aim was to validate the GMS measures of affect against symptoms of depression, stress, and fatigue in adults from the working population.

2. Method

2.1. Participants

In a two-year prospective longitudinal study on personality and fatigue at work, 876 Dutch persons who were called using the random digit dialing method and worked at least 20 h a week completed a range of questionnaires at time 1. The data presented here were collected at the fourth wave of the study; i.e., at the 18-month follow-up, the GMS and PANAS were included to examine the effects of personality and work-stress on subjective mood status. From the 765 persons who had indicated at time 1 that they were willing to participate in follow-up assessment, 228 (35.9%) returned completed questionnaires at the 18-month follow-up. Respondents answered a number of questions concerning their age, gender, marital status, educational level, and work characteristics (e.g., hours working per week, type of contract). These data were included as important indices of socio-demographic status.

The mean age was 41.4 ± 9.2 years (range 20–63), 118 were females, the majority had a middle (48%; 10–14 years of schooling) or high (47%; 14+ years of schooling) level of education, 54 (24%) were blue-collar workers and 174 (76%) white-collar workers, and 69.7% were living with a partner. This group of respondents differed from the original group regarding mean number of working hours (i.e., 37.6 ± 9.6 versus 35.4 ± 8.6, $p = 0.006$) and female sex (i.e., 51.8% versus 45.2%, $p = 0.022$). The respondents did not differ from

non-responders regarding other socio-demographic variables, personality characteristics (emotional stability, extraversion, temperamental dispositions), or symptoms of fatigue and burnout. Information on the original and present sample is presented in Table 1. Participants in this study completed a number of questionnaires to assess negative/positive affect, stress, depression and fatigue, and overall role functioning; all questionnaires used were validated in Dutch language.

2.2. GMS and PANAS measures of negative and positive affect

2.2.1. GMS

The GMS comprises 10 negative and 10 positive mood terms that are commonly reported by non-psychiatric individuals (Denollet, 1993a). The respondent is asked to rate on a 5-point scale (ranging from 0, *not at all* to 4, *extremely*) the extent to which he/she has experienced each mood state lately; scores on both the NA and PA scales range from 0 to 40. Both the NA and PA scales of the GMS are internally consistent; i.e., Cronbach's $\alpha = .94$ and $\alpha = .91$ (Denollet, 1993a), $\alpha = .87 - .94$ and $\alpha = .85 - .90$ (Lowe et al., 2000), $\alpha = .90$ and $\alpha = .90$ (Hevey et al., 2004), respectively. The GMS has also been shown to be responsive to treatment-related changes in negative and positive affect among cardiac patients (Bennett et al., 1999; Denollet and Brutsaert, 1995; Hevey et al., 2004).

2.2.2. PANAS

The PANAS also consists of 10 negative and 10 positive mood terms and a 5-point Likert-type response scale from 1, *very slightly or not at all*, to 5, *extremely*, with scale scores ranging between 10 and 50 (Watson et al., 1988). In this study, the scale scores were calculated to range between 0 and 40 (i.e., scale score — 10), and respondents were asked to indicate how often they felt that way in general. The validity and internal consistency (NA, $\alpha = .87$; PA, $\alpha = .88$) of the PANAS are good, with the test–retest reliability being the highest for the "general" temporal instruction (Watson et al., 1988).

2.3. Measures of stress, depression and fatigue

Apart from validation against the PANAS affect measure, we wanted to validate the GMS against symptoms of stress, depression, and fatigue in the working population.

2.3.1. Perceived Stress Scale (PSS)

To examine the extent to which the GMS reflects the 'wear and tear' of stress on the affective status of working adults, respondents completed the PSS (Cohen et al., 1983). The PSS comprises 14 items that measure the degree to which individuals appraise situations in their lives as stressful and its response scale ranges from 0, *never*, to 4, *very often* (scores range 0–56). The PSS has been associated with increased risk of upper respiratory infections (Cohen et al., 1997). The PSS is stable over time (test–retest reliability $r = .80$) and correlates $r = .62$ with the Daily Stress Inventory (Machulda et al., 1998).

2.3.2. Center for Epidemiological Studies-Depression (CES-D) scale

Chronic stress frequently results in self-reported depressive symptomatology. The CES-D was used to assess depressive symptoms (Radloff, 1977). The CES-D is a well-established, 20-item self-report scale designed to measure the presence and degree of depressive symptoms in survey research populations. The rating scale ranges from 1, *seldom or never*, to 4, *(almost) always*. The CES-D has good psychometric properties in terms of reliability and validity (Beekman et al., 1997); i.e., Cronbach's $\alpha = .87$ and test–retest reliability $r = .51$. The CES-D correlates between .54 and .65 with other standard measures of negative affect and anxiety (Hann et al., 1999) and is a frequently used depression scale in general population studies (Grucza et al., 2003).

2.3.3. Fatigue Assessment Scale (FAS)

Because stress is also frequently associated with symptoms of fatigue, participants completed the FAS (Michielsen et al., 2003). This 10-item scale (bothered by fatigue, tired quickly, don't do much, enough energy, physically exhausted, problems to start things, problems thinking clearly, no desire to do anything, mentally exhausted, and cannot concentrate well) contains five symptoms of physical fatigue and five symptoms of mental fatigue. The FAS is internally consistent ($\alpha = .90$) and correlates .65 with the CES-D (Michielsen et al., 2003).

2.4. Measures of role functioning

We also assessed burnout and quality of life (QoL) as indicators of maladaptive and adaptive role functioning in the working population, respectively.

2.4.1. Maslach Burnout Inventory (MBI)

The MBI assesses burnout as a clear indication of maladaptive functioning in the working population (Maslach and Jackson, 1986). The MBI has 16 items,

each with a 7-point rating scale ranging from 1, *never*, to 7, *always*, that focus on three components of burnout-*emotional exhaustion*, feelings of *personal competence*, and *depersonalization*. The reliability ($\alpha = .87$, .77 and .73; test–retest reliability $r = .65$, .67 and .60; Schaufeli, 1995) and construct validity (Taris et al., 1999) of these MBI scales are good.

2.4.2. World Health Organization Quality of Life-short form (WHOQOL-Bref)

Since QoL is a marker of adaptive role functioning, the WHOQOL-Bref was included in the study. It is a cross-culturally developed generic QoL measure that has also been validated in the Netherlands (De Vries and Van Heck, 1997). The WHOQOL-Bref consists of 26 items (5-point response scales) covering global quality of life and four domains (WHOQOL Group, 1998). In the present study, the global facet and three domains from the WHOQOL-Bref were used: physical health, psychological health, and social relationships. Domain scores range from 4 to 20. The WHOQOL-Bref is able to discriminate between the QoL of well and ill persons, and the Cronbach αs of its subscales are generally above .70 (WHOQOL Group, 1998).

2.5. Statistical analysis

Exploratory factor analysis (oblique rotation; SPSS) of the combined GMS and PANAS item-pool was used to explore the position of the GMS items in terms of valence (positive/negative) and activation (high/low). We expected this analysis to yield one common PA factor and two different NA factors; i.e., high-activation NA (PANAS) versus low-activation NA (GMS). The scree plot criterion was used to determine the number of factors to retain (Cattell, 1966) because the eigenvalues > 1 criterion may overestimate dimensionality and causes factors to split into bloated specifics. Cronbach's α was used to estimate the internal consistency of the GMS and PANAS scales. The frequency distribution of the NA scales was examined to detect any differences in endorsement of mood terms that refer to deactivation and malaise (GMS) versus mood terms that refers to arousal and anxious apprehension (PANAS). Pearson correlations and second-order scale level factor analysis with the PA and NA scales and the self-reported symptoms of stress, depression and fatigue were used to further examine the construct validity of the GMS. Fisher Z-tests were performed in order to determine whether differences between Pearson correlations were statistically significant. Pearson correlations and scale-level factor analysis

also included measures of burnout and QoL as indicators of maladaptive and adaptive role functioning in the working population, respectively.

3. Results

Lower educated people were somewhat underrepresented and highly educated persons slightly overrepresented (Table 1). Accordingly, 3 out of 4 respondents were white-collar workers.

3.1. Convergent validity of the GMS and PANAS

The correlation of $r = .79$ between the PA scales of the GMS and PANAS indicated that they shared about 65% of common variance. The NA scales of the GMS and PANAS correlated $r = .56$. GMS-PA and GMS-NA scale were internally consistent: Cronbach's $\alpha = .94$ and $\alpha = .93$, respectively; corresponding figures for the PANAS were $\alpha = .87$ (PA scale) and $\alpha = .86$ (NA scale). These findings provided evidence for the convergent validity of the GMS measure of negative and positive affect.

Exploratory factor analysis of the 40 mood terms comprising the GMS and PANAS yielded a scree plot indicating an 'elbow' that inflected at the 4th factor, indicating three affect dimensions that accounted for 37%, 11% and 7% of the total variance, respectively. Succeeding factors were much smaller and roughly similar in size. This analysis yielded one common positive affect (Table 2, left) but two different negative affect dimensions (Table 2, right). In this model, 8 out of 10 GMS-NA terms loaded high on the second dimension reflecting feelings of malaise and listlessness (Table 2, right).

Table 1
Demographic information of the respondents in the present and the original sample

		Original sample	Present sample
Gender:	Female (%)	346 (45.2)	118 (51.8)
	Male (%)	409 (53.5)	109 (47.8)
	Missing (%)	10 (1.3)	1 (0.4)
Partner:	No partner (%)	218 (28.5)	68 (29.8)
	Partner (%)	544 (71.1)	159 (69.7)
	Missing (%)	3 (0.4)	1 (0.5)
Education[a]:	Low (6–10 years) (%)	36 (4.7)	8 (3.5)
	Middle (10–14 years) (%)	390 (51.0)	110 (48.2)
	High (>14 years) (%)	325 (42.5)	106 (46.5)
	Missing (%)	14 (1.8)	4 (1.8)
Age:	Mean ± SD	40.3 ± 9.7	41.4 ± 9.2

[a] Years of schooling.

Table 2
Exploratory factor analysis of the GMS/PANAS mood terms: 3-factor solution

Positive affect		Factor analysis			Negative affect		Factor analysis		
		I	II	III			I	II	III
GMS13.	Enterprising	**.81**	−.14	.09	GMS18.	Fatigued	−.02	**.85**	.00
GMS09.	Lively	**.79**	−.18	.06	GMS12.	Tired	.01	**.85**	.03
GMS04.	Dynamic	**.76**	−.20	.03	GMS03.	Worn out	.01	**.83**	.06
PANAS19.	Active	**.74**	−.17	.11	GMS10.	Physically weak	.03	**.81**	−.04
GMS07.	Hard-working	**.71**	−.10	.16	GMS19.	Weakened	.02	**.81**	.03
GMS20.	Self-confident	**.71**	.03	−.32	GMS01.	Wearied	.05	**.76**	.18
PANAS12.	Alert	**.71**	.18	.01	GMS08.	Feeble	.00	**.66**	.17
GMS05.	Bright	**.70**	−.03	−.11	GMS11.	Listless	−.20	**.62**	.11
PANAS16.	Determined	**.70**	.15	−.20	GMS06.	Helpless	−.19	.32	.28
GMS02.	Active	**.70**	−.28	.14	PANAS20.	Scared	−.18	.02	**.64**
PANAS14.	Inspired	**.68**	.05	−.13	PANAS07.	Afraid	−.18	−.04	**.62**
PANAS09.	Enthusiastic	**.67**	−.06	−.01	PANAS04.	Distressed	−.05	.18	**.59**
GMS16.	Sociable	**.66**	−.04	−.08	PANAS02.	Upset	−.13	.15	**.58**
GMS17.	Cheerful	**.66**	−.08	−.18	PANAS15.	Nervous	−.12	.07	**.57**
PANAS05.	Strong	**.65**	.03	−.07	PANAS13.	Ashamed	.06	.12	**.53**
PANAS17.	Attentive	**.65**	.15	−.10	PANAS11.	Irritable	−.10	.10	**.52**
PANAS10.	Proud	**.65**	.12	−.08	PANAS06.	Guilty	−.14	.05	.46
GMS14.	Relaxed	**.51**	−.15	−.24	PANAS18.	Jittery	−.02	.25	.45
PANAS01.	Interested	.44	−.02	−.00	GMS15.	Insecure	−.28	.11	.44
PANAS03.	Excited	.29	−.09	.35	PANAS08.	Hostile	−.10	.14	.32
Eigenvalue		I=14.8			Eigenvalue			II=4.2	III=2.7

GMS: Global Mood Scale; PANAS: Positive and Negative Affect Schedule; PA: positive affect. Factor loadings of mood terms ≥ .50 are presented in boldface.

Seven out of 10 PANAS-NA terms loaded high on the third affective dimension reflecting feelings of anxious apprehension and arousal (Table 2, right). Most mood terms not only had a high loading on their corresponding affect dimension but also a substantially lower loading on the opposite negative affect dimension. That is, 8 GMS-NA terms had a loading on factor II that was at least .40 greater than their loading on factor III, and 7 PANAS-NA terms had a loading on factor III that was at least .40 greater than their loading on factor II. These findings suggest that the majority of the negative mood terms of the GMS and PANAS scales may represent opposites on the activation dimension of affect (Russell and Carroll, 1999). As expected, the extraction of a fourth factor did not generate a meaningful affect model; i.e., only the PANAS-PA item "excited" loaded on this fourth affect.

3.2. Mean GMS and PANAS scores of negative affect

Apart from factor analytic findings, differences in mean scores also highlighted the different focus of the GMS-NA and PANAS-NA scales. The mean negative affect score of the GMS (7.5 ± 6.7, range 0–40) was significantly higher than that of the PANAS (5.4 ± 5.0, range 0–40), $t(1, 227) = 5.62$, $p < .0001$. Next, PANAS-

NA scores were categorized in tertiles, reflecting low (=0–2, 32.5%), intermediate (=3–6, 35%) and high (=7–40, 32.5%) scores, respectively. Using the same cut–off values for the GMS–NA scores (Fig. 1), a smaller proportion of participants had a low NA score (20.5%, $\chi^2(1) = 8,20$, $p = .004$) while a greater proportion of participants had a high NA score (43.5%, $\chi^2(1) = 5,82$, $p = .016$). Hence, individuals from the working population may perceive mood terms that refer to deactivation and malaise (e.g., *fatigued, listless* from the GMS) as being more relevant to describe their negative affect, as compared to terms that refer to
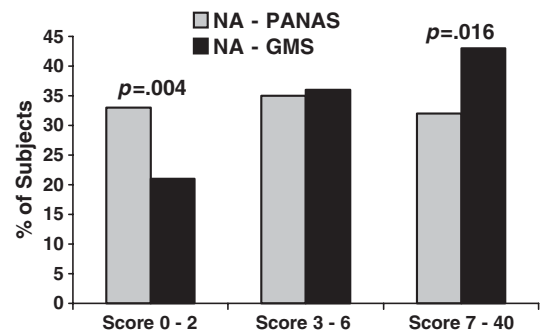

Fig. 1. Percentage of subjects scoring low, intermediate or high on negative affect. NA: negative affect.

arousal and anxious apprehension (e.g., *upset, scared* from the PANAS).

3.3. Stress, depression and fatigue

The PSS measure of stress correlated with both the negative affect (.62 and .63; $Z=0.25$, ns) and positive affect ($-.69$ and $-.56$; $Z=-3.23$, $p<0.01$) scales of the GMS and PANAS, respectively (Table 3). In a similar vein, the CES-D measure of depression correlated with the GMS/PANAS scales of both negative (.61/.58; $Z=-0.70$, ns) and positive ($-.65/-.49$; $Z=-3.59$, $p<0.01$) affect. Fatigue correlated negatively with PA scales of the GMS ($-.68$) and PANAS ($-.54$), and positively with the NA scales of the GMS (.78) and PANAS (.52). In both instances, fatigue was correlated higher with the GMS than the PANAS ($Z=-3.37$, $p<0.01$ and $Z=-7.04$, $p<0.01$ for PA and NA scales, respectively).

3.4. Role functioning: burnout and QoL

The GMS scales correlated in a consistent way with the burnout and QoL indicators of role functioning in the present sample of adults from the working population (Table 3). The GMS-NA scale displayed high correlations with feelings of emotional exhaustion (.72) as a major characteristic of burnout, and with (impaired) physical health status ($-.66$). The corresponding correlations for the PANAS-NA scale were .45 ($Z=-6.34$, $p<0.001$) and $-.31$ ($Z=-7.08$, $p<0.001$), respectively. The GMS-PA scale correlated

positively with mental health (.70), feelings of competence (.52), and satisfaction with social relations (.42). The corresponding correlations for the PANAS-PA scale were .64 ($Z=-1.64$, $p=0.05$), .50 ($Z=-0.41$, ns) and .42 ($Z=0$, ns), respectively. These findings corroborate the validity of the GMS as a measure that reflects meaningful affective correlates of adaptive and maladaptive role functioning.

3.5. Construct validity of the GMS negative and positive affect scales

Scale level factor analysis yielded two affect dimensions (both as indicated by scree plot and eigenvalue criteria) reflecting negative and positive affect, respectively (Table 3, right side). The negative affect dimension was best represented by the GMS-NA scale (loading=.86), feelings of fatigue (.82) and emotional exhaustion (.79), and complaints of poor physical QoL (loading=$-.83$ on the WHOQOL Physical Health scale). The positive affect dimension was best represented by the GMS-PA (.72) and PANAS-PA (.74) scales, feeling of personal competence (.71), mental health (.73), and satisfaction with social relations (.70). These findings revealed a remarkably consistent pattern of convergent and discriminant validity regarding the GMS-NA scale and GMS-PA/PANAS-PA scales as markers of negative and positive affect, respectively.

The PANAS-NA scale, however, loaded on both affect dimensions, with a higher negative correlation on the positive affect dimension (loading=$-.50$) as

Table 3
Construct validity of the GMS NA and PA scales in relation to stress, depression, fatigue and role functioning

		Correlation matrix [a]				Factor analysis [b]	
		GMS-NA	PANAS-NA	GMS-PA	PANAS-PA	Factor I	Factor II
GMS	Negative Affect	–				**.86**	−.20
PANAS	Negative affect	.56	–			.44	−.50
GMS	Positive affect	−.54	−.52	–		−.46	**.72**
PANAS	Positive affect	−.40	−.41	.79	–	−.27	**.74**
PSS	Perceived stress	.62	.63	−.69	−.56	*.55*	*−.65*
CES-D	Depressive symptoms	.61	.58	−.65	−.49	*.58*	*−.61*
FAS	Fatigue	.78	.52	−.68	−.54	**.82**	−.37
MBI	Emotional exhaustion	.72	.45	−.54	−.40	**.79**	−.23
MBI	Competence	−.20	−.31	.52	.50	−.10	**.71**
MBI	Depersonalization	.41	.38	−.49	−.39	.42	−.45
WQOL	Physical health	−.66	−.31	.50	.36	**−.83**	.19
WQOL	Mental health	−.54	−.51	.70	.64	−.48	**.73**
WQOL	Social relationships	−.24	−.35	.42	.42	−.02	**.70**
Eigenvalues						7.79	1.45

CES-D: Center of Epidemiological Studies Depression scale; FAS: Fatigue Assessment Scale; GMS: Global Mood Scale; MBI: Maslach Burnout Inventory; PANAS: Positive and Negative Affect Schedule; PSS: Perceived Stress Scale; WQOL: WHO Quality Of Life-Bref.

[a] All correlations, $p<.0001$; except $r=-.20$ and $-.24$, $p<.005$.

[b] Loading of scales assigned to a factor are presented in boldface; loadings $>.50$ on both factors are presented in italics.

compared to the GMS-NA (loading = −.20). Stress and depression loaded on both the negative and positive affect dimensions (Table 3, right side). Hence, the PSS and CES-D scales appeared to tap negative as well as low positive mood states. Depersonalization also loaded on both affect dimensions. Fatigue, however, had a much higher loading (.82) on the negative affect dimension as compared to its loading (−.37) on the positive affect dimension.

4. Discussion

The present findings support the validity of the GMS as a measure of affective mood states. The PA and NA scales from the GMS correlated highly with the PA/NA scales from the PANAS, respectively. Factor analysis incorporating all of the 40 GMS and PANAS mood terms showed that a three-factor solution yielded one positive affect and two negative affect mood dimension. With regard to positive affect, the present study yielded one common factor on which the PA scales of both questionnaires loaded. PA was associated with mental health, personal feelings of competence, and greater satisfaction with social relationships. These outcomes are consistent with the literature on affect and quality of life.

Abbey and Andrews (1985), for instance, reported that PA was closely related to quality of life-as-a-whole. This finding emphasizes the need to consider the capacity to experience positive emotions as a fundamental human strength that enhances people's physical, social and psychological resources (Fredrickson, 2001; Fredrickson et al., 2003). In a similar vein, the capacity to enhance the experience of positive emotions is also fundamental in the recently proposed well-being therapy (e.g. Belaise et al., 2005). With reference to this issue, recent evidence also suggests that higher levels of PA may trigger upward spirals toward enhanced emotional well-being in the future (Fredrickson and Joiner, 2002).

The negative mood terms from the GMS and PANAS may be separated in two affect dimensions reflecting emotional exhaustion (*deactivation*) and anxious apprehension (*activation*) as different affective components of the stress process (Larsen et al., 2001; Russell and Carroll, 1999). The NA scale from the GMS scale was originally developed to reflect the consequences of chronic stress that may lead to deactivation and exhaustion. This is also indicated by significant correlations with fatigue, exhaustion, stress, and depression in the present study. Hence, the close relationship between GMS-NA and symptoms of fatigue and exhaustion is not surprising because many mood terms of the GMS refer to fatigue, listlessness and

malaise. Evidence suggests that fatigue often is an aspect of the emotional status of individuals (Chen, 1996) and not necessarily a response to somatic disease (Denollet, 1993a) or medical treatment (Salmon and Hall, 2001). Fatigue is one of the criteria for depression (American Psychiatric Association, 1994) and the CES-D also incorporates an item on fatigue (Radloff, 1977). These observations indicate that the GMS-NA scale may explain much of the variance in depression and exhaustion as markers of failing adaptive mechanisms in working adults who suffer from chronic stress.

Overall, both GMS mood scales tended to correlate somewhat higher with the stress, depression, fatigue and burnout measures as compared to their corresponding PANAS scales. The high correlations of perceived stress, depressive symptoms, and fatigue with both negative affect (positive correlation) and positive affect (negative correlation) seem to support the tripartite model of Clark and Watson (1991) pointing at the specificity of anhedonia to depression (Cox et al., 2001; Joiner et al., 2003). In accordance with this model, depressive symptoms were associated with high negative affect and low positive affect. This finding also suggests that fatigue can be conceptualized both as a marker of low positive affect (Watson et al., 1999) and as a marker of high negative affect (Denollet, 1993a). This conceptualization may have clinical implications for behavioral intervention in patients with chronic fatigue complaints; i.e., such an intervention should focus on both enhancement of positive and reduction of negative affect.

Outcome measures that are used to examine the effect of intervention need to be responsive to changes in mood status (Denollet, 1993b). Recent evidence shows that the GMS measures state mood rather than trait mood; i.e., cardiac rehabilitation resulted in a significant increase in positive affect and a significant decrease in negative affect as a mood state (GMS) but not in negative affectivity as a personality trait (Denollet, 2005). Hevey et al. (2004) also showed that out of nine scales, including the SF-36 and State Trait Anxiety Inventory, the GMS was the most responsive outcome measure in the context of cardiac rehabilitation. The working adults from the present study scored higher on the GMS-PA scale and lower on the GMS-NA scale as compared to adults who had experienced a cardiac event (Denollet, 1993a). This finding provides additional support for the responsiveness of the GMS to changes in health-related mood status. Treatment-related changes on the GMS have also been found to predict enhanced long-term survival in cardiac patients (Denollet and Brutsaert, 2001). Behavioral intervention in individuals who score high on the GMS-NA scale is likely to include an

activation component, such as guided exercise training, in order to enhance the general level of energy.

The present study has a number of limitations. The cross-sectional design of the study does not allow any inferences on causality. The sample size is limited, and lower educated people were underrepresented (although the latter fact is not uncommon for this kind of study; e.g., Saris, 1988). Furthermore, a working population reflects a selection from the general population, and investigating relationships between the GMS and other instruments simultaneously in different populations are needed. The present sample was part of an initially larger population of working persons, and the response rate had dropped considerably between the start of the study and the present wave of the study. However, this response rate approximates the rate that has been found in other postal studies (Heberlein and Baumgarter, 1978; Yeung and Hemsley, 1997), the initial and present sample did not differ concerning most studied aspects, and the mean scores of the psychological scales were comparable to those reported in the literature. Considering potentially interesting outcome variables, e.g., absence from work, inability to work, or sick leave, longitudinal studies are needed to examine the predictive value of the GMS. Finally, research is needed on temperamental dispositions (Grucza et al., 2003) and affective disorder (Sloan et al., 1997) as important correlates of affective experience in the context of work-related stress.

Our findings in working adults did corroborate those from previous research showing that the GMS has good psychometric properties in cardiac populations (Bennett et al., 1999; Denollet, 1993a; Lowe et al., 2000; Hevey et al., 2004; Thornton and Hallas, 1999). Until now, the extent to which the GMS can be considered a measure of mood applicable to noncardiac populations remained undetermined (Hevey et al., 2004). The present study indicates that the GMS is applicable to noncardiac populations as well and thus provides researchers with a valid instrument to investigate positive affect in addition to the generally extensively investigated domain of negative affect. We would like to recommend researchers to consider the GMS for use in studies on depression/exhaustion as markers of failing adaptive mechanisms in individuals who may suffer from chronic stress. That is, the deactivated mood terms of the GMS-NA scale were significantly correlated with the stress, depression and exhaustion measures, while negative mood terms from the PANAS reflecting arousal did not evidence higher correlations with these measures.

Moreover, the mean NA score of the GMS was significantly higher than that of the PANAS, suggesting that adults from the working population may perceive mood terms that refer to malaise and deactivation as being especially relevant to describe their negative affective status. The GMS is also a useful tool in research on health status. In this study, the GMS-NA scale was associated with poor self-perceived health in working adults. Similarly, NA has been shown to have a negative effect on self-perceived health both in experimental research (Croyle and Uretsky, 1987) and in clinical populations (Provinciali et al., 1999; Smith and Christensen, 1996). Finally, the GMS may benefit outcome research on the effect of multidisciplinary intervention in non-psychiatric populations; e.g., the GMS-PA scale is very responsive to the effects of rehabilitation (Hevey et al., 2004) and treatment-related changes on the GMS-NA scale may predict long-term mortality (Denollet and Brutsaert, 2001) in cardiac patients.

Positive and negative affect are increasingly be identified as distinctly different features of emotional experience in relation to a wide variety of health-related outcome measures. For example, positive affect has recently been associated with a increased procoagulant responses to mental stress that may be associated with pathogenesis of coronary artery disease, and negative affect with attenuated procoagulant responses (von Känel et al., 2005). Health-related quality of life is also cited increasingly often as an outcome measure in cardiovascular patients (McGee et al., 2005), and affective mood status is a major dimension of quality of life in these patients (Denollet, 1993a). Accordingly, the GMS is currently being used to compare outcomes of different treatments in patients with myocardial infarction, angina pectoris, and heart failure as part of the ongoing Euro Cardio-QoL Project (Oldridge et al., 2005). The present study provides new evidence for the notion that the GMS is a good measure of positive and negative affect in adults from the general population. High Cronbach's α values confirmed the internal-consistency of its PA and NA scales. These scales correlated highly with their corresponding PANAS scales, and the GMS had good construct validity in terms of stress, depression, fatigue and role functioning. In sum, the GMS is a psychometrically sound measure of affect that is equally applicable in non-cardiac populations, and may benefit research on the effects of chronic stress and its health-effects.

References

Abbey, A., Andrews, F.M., 1985. Modeling the psychological determinants of life quality. Soc. Indic. Res. 16, 1–34.

American Psychiatric Association, 1994. Diagnostic criteria for major depressive episode. Diagnostic and Statistic Manual of Mental Disorders IV (DSM-IV). American Psychiatric Association, Washington, DC, p. 327.

Beekman, A.T., Deeg, D.J., Van Limbeek, J., Braam, A.W., De Vries, M.Z., Van Tilburg, W., 1997. Criterion validity of the center for epidemiologic studies depression scale (CES-D): results from a community-based sample of older subjects in the Netherlands. Psychol. Med. 27, 231–235.

Belaise, C., Fava, G.A., Marks, I.M., 2005. Alternatives to debriefing and modifications to cognitive behavior therapy for posttraumatic stress disorder. Psychother. Psychosom. 74, 212–217.

Bennett, P., Mayfield, T., Norman, P., Lowe, R., Morgan, M., 1999. Affective and social-cognitive predictors of behavioral change following first myocardial infarction. Brit. J. Health Psychol. 4, 247–256.

Cattell, R.B., 1966. The meaning and strategic use of factor analysis. In: Cattell, R.B. (Ed.), Handbook of Multivariate Experimental Psychology. Rand McNally, Chicago.

Chen, M.K., 1986. The epidemiology of self-perceived fatigue among adults. Prevent Med. 15, 74–81.

Clark, L.A., Watson, D., 1991. Tripartite model of anxiety and depression: psychometric evidence and taxonomic implications. J. Abnorm. Psychol. 100, 316–336.

Cohen, S., Kamarck, T., Mermelstein, R., 1983. A global measure of perceived stress. J. Health Soc. Behav. 24, 385–396.

Cohen, S., Doyle, W.J., Skoner, D.P., Rabin, B.S., Gwaltney, J.M., 1997. Social ties and susceptibility to the common cold. JAMA 277, 1940–1944.

Cox, B.J., Enns, M.W., Walker, J.R., Kjernisted, K., Pidlubny, S.R., 2001. Psychological vulnerabilities in patients with major depression vs panic disorder. Behav. Res. Ther. 39, 567–573.

Croyle, R.T., Uretsky, M.B., 1987. Effects of mood on self-appraisal of health status. Health Psychol. 6, 239–253.

Denollet, J., 1993a. Emotional distress and fatigue in coronary heart disease: the Global Mood Scale (GMS). Psychol. Med. 23, 111–121.

Denollet, J., 1993b. The sensitivity of outcome assessment in cardiac rehabilitation. J. Consult. Clin. Psychol. 61, 686–695.

Denollet, J., 2005. DS14: standard assessment of negative affectivity, social inhibition, and type D personality. Psychosom. Med. 67, 89–97.

Denollet, J., Brutsaert, D.L., 1995. Enhancing emotional well-being by comprehensive rehabilitation in patients with coronary heart disease. Eur. Heart J. 16, 1070–1078.

Denollet, J., Brutsaert, D.L., 2001. Reducing emotional distress improves prognosis in coronary heart disease: 9-year mortality in a clinical trial of rehabilitation. Circulation 104, 2018–2023.

De Vries, J., Van Heck, G.L., 1997. The world health organization quality of life assessment instrument: validation study with the Dutch version. Eur. J. Psychol. Assess. 13, 164–178.

Fredrickson, B.L., 2001. The role of positive emotions in positive psychology. The broaden-and-build theory of positive emotions. Am. Psychol. 56, 218–226.

Fredrickson, B.L., Joiner, T., 2002. Positive emotions trigger upward spirals toward emotional well-being. Psychol. Sci. 13, 172–175.

Fredrickson, B.L., Tugade, M.M., Waugh, C.E., Larkin, G.R., 2003. What good are positive emotions in crises? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. J. Pers. Soc. Psychol. 84, 365–376.

Grucza, R.A., Przybeck, T.R., Spitznagel, E.L., Cloninger, C.R., 2003. Personality and depressive symptoms: a multi-dimensional analysis. J. Affect. Disord. 74, 123–130.

Hann, D., Winter, K., Jacobsen, P., 1999. Measurement of depressive symptoms in cancer patients: evaluation of the center for epidemiological studies depression scale (CES-D). J. Psychosom. Res. 46, 437–443.

Haslam, C., Atkinson, S., Brown, S.S., Haslam, R.A., 2005. Anxiety and depression in the workplace: effects on the individual and organisation. J. Affect. Disord. 88, 209–215.

Heberlein, T.A., Baumgarter, R., 1978. Factors affecting response rates of mailed questionnaires. Am. Soc. Rev. 43, 447–462.

Hevey, D., McGee, H.M., Horgan, J., 2004. Responsiveness of health-related quality of life outcome measures in cardiac rehabilitation: comparison of cardiac rehabilitation outcome measures. J. Consult. Clin. Psychol. 72, 1175–1180.

Iacovides, A., Fountoulakis, K.N., Kaprinis, S., Kaprinis, G., 2003. The relationship between job stress, burnout and clinical depression. J. Affect. Disord. 75, 209–221.

Joiner, T.E., Brown, J.S., Metalsky, G.I., 2003. A test of the tripartite model's prediction of anhedonia's specificity to depression: patients with major depression versus patients with schizophrenia. Psychiatry Res. 119, 243–250.

Larsen, J.T., McGraw, A.P., Cacioppo, J.T., 2001. Can people feel happy and sad at the same time? J. Pers. Soc. Psychol. 81, 684–696.

Lowe, R., Norman, P., Bennett, P., 2000. Coping, emotion and perceived health following myocardial infarction: concurrent and predictive associations. Brit. J. Health Psychol. 5, 337–350.

Machulda, M.M., Bergquist, T.F., Ito, V., Chew, S., 1998. Relationship between stress, coping and postconcussion symptoms in a healthy adult, population. Arch. Clin. Neuropsychol. 13, 415–424.

Maslach, C., Jackson, S.E., 1986. The Maslach Burnout Inventory. Manual, 2nd ed. Sage, Palo Alto, CA.

McGee, H.M., Oldridge, N., Hellemans, I.M., 2005. Quality of life evaluation in cardiovascular disease: role for the European society of cardiology? Eur. J. Cardiovasc. Prev. Rehab. 12, 191–192.

Michielsen, H.J., De Vries, J., Van Heck, G.L., 2003. Psychometric qualities of a brief self-rated fatigue measure: the fatigue assessment scale. J. Psychosom. Res. 54, 345–352.

Nyklíček, I., Pop, V.J., 2005. Past and familial depression predict current symptoms of professional burnout. J. Affect. Disord. 88, 63–68.

Oldridge, N., Saner, H., McGee, H.M., 2005. HeartQoL study investigators: the euro cardio-QoL project. An international study to develop a core heart disease health-related quality of life questionnaire, the HeartQoL. Eur. J. Cardiovasc. Prev. Rehab. 12, 87–94.

Penninx, B.W., Guralnik, J.M., Ferrucci, L., Simonsick, E.M., Deeg, D.J., Wallace, R.B., 1998. Depressive symptoms and physical decline in community-dwelling older persons. JAMA 279, 1720–1726.

Provinciali, L., Ceravolo, M.G., Bartolini, M., Logullo, F., Danni, M., 1999. A multi-dimensional assessment of multiple sclerosis: relationships between disability domains. Acta Neurol. Scand. 100, 156–162.

Radloff, L.S., 1977. The CES-D scale: a self-report depression scale for research in the general population. Appl. Psychol. Assess. 1, 385–401.

Reich, J.W., Zautra, A.J., Davis, M., 2003. Dimensions of affect relationships: models and their integrative implications. Rev. Gen. Psychol. 7, 66–83.

Russell, J.A., Carroll, J.M., 1999. On the bipolarity of positive and negative affect. Psychol. Bull. 125, 3–30.

Salmon, P., Hall, G.M., 2001. Postoperative fatigue is a component of the emotional response to surgery. J. Psychosom. Res. 50, 325–335.

Saris, W.E. (Ed.), 1988. Variation in Response Behavior. A Source of Measurement Error in Survey Research. Sociometric Research Foundation, Amsterdam, Netherlands.

Schaufeli, W., 1995. Utrecht Burnout Scale (UBOS). Utrecht. University of Utrecht, The Netherlands.

Sloan, D.M., Strauss, M.E., Quirk, S.W., Sajatovic, M., 1997. Subjective and expressive emotional responses in depression. J. Affect. Disord. 46, 135–141.

Smith, T.W., Christensen, A.J., 1996. Positive and negative affect in rheumatoid arthritis: increased specificity in the assessment of emotional adjustment. Ann. Behav. Med. 18, 75–78.

Smith, T.W., Ruiz, J.M., 2002. Psychosocial influences on the development and course of coronary heart disease: current status and implications for research and practice. J. Consult. Clin. Psychol. 70, 548–568.

Taris, T.W., Schreurs, P.J., Schaufeli, W.B., 1999. Construct validity of the Maslach burnout inventory—general survey: a two-sample examination of its factor structure and correlates. Work and Stress 13, 223–237.

Thornton, E.W., Hallas, C.N., 1999. Affective status following myocardial infarction can predict long-term heart rate variability and blood pressure reactivity. Brit. J. Health Psychol. 4, 231–245.

Veldhuizen, I.J., Gaillard, A.W.K., De Vries, J., 2003. The influence of mental fatigue on facial EMG activity during a simulated workday. Biol. Psychol. 63, 59–78.

von Känel, R., Kudielka, B.M., Preckel, D., Hanebuth, D., Herrmann-Lingen, C., Frey, K., Fischer, J.E., 2005. Opposite effect of negative and positive affect on stress procoagulant reactivity. Physiol. Behav. 86, 61–68.

Watson, D., Tellegen, A., 1985. Toward a consensual structure of mood. Psychol. Bull. 98, 219–235.

Watson, D., Clark, L.A., Tellegen, A., 1988. Development and validation of brief measures of positive and negative affect: the PANAS scales. J. Pers. Soc. Psychol. 54, 1063–1070.

Watson, D., Wiese, D., Vaidya, J., Tellegen, A., 1999. The two general activation systems of affect: structural findings, evolutionary considerations, and psychobiological evidence. J. Pers. Soc. Psychol. 76, 820–838.

WHOQOL Group, 1998. Development of the world health organization WHOQOL-BREF quality of life assessment. Psychol. Med. 28, 551–558.

Yeung, R.R., Hemsley, D.R., 1997. Personality, exercise and psychological well-being. Pers. Indiv. Diff. 22, 47–53.