Single item on positive affect is associated with 1-year survival in consecutive medical inpatients

Martin Scherer, M.D. \textsuperscript{a}, Christoph Herrmann-Lingen, M.D. \textsuperscript{b,\*}

\textsuperscript{a}Department of General Practice, University of Göttingen, D-37099 Göttingen, Germany
\textsuperscript{b}Department of Psychosomatic Medicine, University of Göttingen, D-37075 Göttingen, Germany

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Abstract

Objective: To determine the independent effects of positive and negative affect items on mortality in consecutive medical inpatients.

Methods: Consecutive general medical inpatients were asked to complete the Hospital Anxiety and Depression Scale (HADS) at admission. Prognostic indicators were obtained from patients’ records and physicians’ ratings. The study end point was mortality from all causes at 1 year.

Results: The baseline assessment was completed by 575 patients (87.7%). Survival data were available for 572 of these (86 deaths). HADS depression scores and several physical risk indicators predicted mortality. Independent effects could be observed for HADS item 1 (“Can enjoy things as much as before”) adjusted for physicians’ ratings of prognosis, a principal diagnosis of hemato-oncological disease and Charlson comorbidity scores. In contrast, HADS depression items 2–7 (Model 1) as well as positive HADS depression scores did not contribute significantly to the prediction of mortality.

Conclusion: Our present results suggest that one single item on positive affect independently predicts 1-year survival in consecutively admitted medical inpatients. Interestingly, this item has a stronger association with survival status than the presence of depressed mood.

Keywords: Positive affect; Mortality; Comorbidity; Medical patients

1. Introduction

Depressive mood has repeatedly been identified as a predictor of mortality in a variety of medical patient groups. In an earlier study, we could confirm an independent effect of depressed mood on mortality in a typical mixed patient population seen on general medical wards [1]. Like most other research in this area, our previous study focused on negative affect as a predictor of mortality, using an established measure of depressive mood, such as the Hospital Anxiety and Depression Scale (HADS) [2].

Depressive mood, however, is only part of the emotional dimensions of well-being. Measures for depressive mood, such as the HADS, include items that reflect negative affect (e.g., “I feel slowed down”) as well as items that reflect positive affect (e.g., “I can enjoy things”) that are then coded in reverse order and added to negative affect items in order to calculate the depression scale. However, psychological literature suggests that positive and negative affect are not simply bipolar opposites [3]. High positive affect may be understood as a state of high energy, full concentration and pleasurable engagement, whereas low negative affect may be seen as a state of calmness and serenity [4]. Therefore, positive and negative affect should be treated as relatively independent constructs.

A growing body of evidence indicates that positive affect has a stronger association with clinically relevant end points including premature mortality and adverse cardiovascular outcomes than negative affect [5–10]. For example, Ostir et al. [11] demonstrated that the positive items on the Center for Epidemiologic Studies Depression Scales (CES-D) but not the negative affect items were predictive of better mobility and functional status and lower risk of mortality in a population-based sample of older participants. However, authors of a comprehensive review suggested that there is too little evidence regarding positive affect and long-term prognosis across the few survival studies to draw any
conclusions [12]. Especially in populations with heterogeneous principal diagnoses the impact of positive affect on survival remains yet unclear.

Given the distinct properties of positive and negative affect, it is important to distinguish their potential influences on health outcomes and especially on mortality [4]. We therefore re-analysed the data of our previous study cited above and examined the question of how and to what extent the single items of the HADS reflecting positive or negative affect independently predict mortality in consecutively admitted medical inpatients.

2. Method

2.1. Study design

This is a secondary analysis of a longitudinal observation study which was primarily designed to examine the independent effect of depressed mood on mortality in a group of consecutive medical inpatients [1]. In the present study, it was our main aim to get a fuller understanding of which aspects of positive or negative affect indicated by the different individual HADS depression items independently predicted mortality.

2.2. Recruitment

Six hundred and fifty-six patients consecutively admitted to five general medical wards of the University Hospital at Göttingen, Germany, a 1200-bed tertiary care centre, were considered eligible for the study. The wards included can be considered representative for all nine general medical wards of this hospital. Of the 656 patients, 575 (87.7%) gave their informed consent and completed the Hospital Anxiety and Depression Scale within 2 days of admission. Among these, there were 92 patients (16.0%) who were willing to participate but felt unable to complete the questionnaires without help. The text of each item and the corresponding answering options were read aloud to these patients and their answers were recorded. Forty-two patients (6.4%) had to be excluded for the following reasons: they either spent less than 24 h on the ward (n=3), were missed for logistic reasons (n=8), were unable to understand German (n=15) or had severe cerebral dysfunction or general weakness (n=16). The relatively low number of patients with severe cerebral dysfunction was due to the fact that patients with predominantly neurological symptoms such as stroke are treated in the Department of Neurology rather than in the internal medicine department. Thirty-nine patients (5.9%) refused to participate.

2.3. Data collection

2.3.1. Hospital Anxiety and Depression Scale

The HADS is a well-validated and widely used self-assessment instrument [2]. It has been developed as a psychological screening tool for medical patients [13] and is sensitive to less severe forms of mental disorders which are of special importance in this setting. High HADS depression scores have been related to increased mortality in several studies of healthy persons and patients with a variety of medical conditions [14–17]. Like all self-assessment questionnaires, the HADS indicates probable presence of morbidity anxiety or depression, but does not allow one to make specific diagnoses. Some of its accepted advantages lie in its shortness and relative independence of somatic indicators of depression (such as weight loss), which could in the presence of physical disease lead to false-positive findings. The two subscales, each consisting of seven items with four-point scales (0–3), give separate scores for anxiety and depression. Possible ranges are from 0 to 21, with 0 indicating minimal and 21 indicating maximal psychological symptomatology. As recommended in the German test manual [18], depression scores >8 were considered abnormal.

2.3.2. Ascertainment of medical and sociodemographic data

For all patients, detailed medical data were recorded. In addition to demographic characteristics, these included the principal medical diagnosis, all comorbid diagnoses, and established physical risk factors such as body mass index, smoking status and alcohol consumption. These data were taken from the patients’ records and interviews with the attending physicians. Social integration was rated in a standardized manner on a three-point ordinal scale based on the existence of a stable partnership, housing situation and social environment, and on the absence of specific social problems.

2.3.3. Comorbidity and physicians’ ratings of prognosis

The Charlson comorbidity index [19] was computed for each patient. This index had been developed as a standardized measure of comorbidity in prospective studies of cancer treatment. It consists of a weighted sum score of a number of major comorbid diseases and has been shown to be a strong predictor of mortality in some patient groups [19,20]. All conditions described by Charlson et al. [19] were maintained, including dementia and cerebrovascular disease. Comorbid diagnoses not included in the Charlson index were counted to form a second, unweighted measure of comorbidity.

In addition, the attending physicians, who were unaware of patients’ HADS scores, were asked to estimate the prognosis of 1-year survival on a three-point ordinal scale (0=excellent or good; 1=fair; 2=poor or grim) as a measure of overall disease severity. Since ratings of disability are known to be strongly correlated with depression [21], and a standardized nurses’ rating of disability did not contribute to the prediction of mortality in a previous sample [14], no measure of disability was used in the present study.

2.3.4. Collection of follow-up data

One year after the baseline admission, all study patients were sent a follow-up questionnaire. Local authorities were contacted in writing, in order to obtain official survival data for nonresponders or patients who had not completed the
baseline questionnaire. Official registry data on survival status and exact dates of death were provided by the local registry offices. However, only all-cause mortality is available from this source, while specific causes of death are not documented in these registries.

2.4. Data analysis

All data were entered into a computerized database and analyzed using SPSS standard software. Before computing Cox regression analyses, the proportional hazards assumption was tested by inspection of log (−log)-transformed survival curves. This inspection showed that the assumption was met for the analyses presented. Results were considered significant at an alpha of <0.05.

Two multivariate Cox regression analyses were computed with time to death being the dependent variable and different sets of predictors. Both models were adjusted for three predictors that emerged in our previous analysis [1]: physicians’ ratings of prognosis, a principal diagnosis of hemato-oncological disease and Charlson comorbidity score. The third predictor was introduced as raw values. Although these showed a nonnormal distribution, results were unchanged in alternative computations using log-transformed, z-standardized or rank-ordered Charlson scores. HADS depression items and physician-rated prognosis, which must be considered ordinal variables, were entered as continuous data in the main analyses. Secondary analyses were performed with HADS depression items and physician-rated prognosis as categorical variables. These models produced similar results as the main analyses. In the first model, the previously established predictors and the raw values of each HADS depression item were entered simultaneously. In the second analysis, HADS depression (dichotomized at the predefined cutoff) and any independently significant items from the first model were added to the three somatic predictors mentioned above. Five hundred and fifty-nine patients (with 82 deaths) had valid data on all three somatic predictors. Twenty-two percent had abnormal depression scores. HADS depression items and physician-rated prognosis were also strongly associated with comorbidity score or a lower body mass index. Physicians’ ratings of prognosis were also strongly associated with mortality [unadjusted odds ratio (OR) for highest vs. lowest risk estimate 27.9; 95% confidence interval (CI):

Between the 575 patients included in the study and the 81 patients who were unable or unwilling to participate, there were no significant differences in age, sex, marital status, diagnostic groups or comorbidity scores. Among the study participants, there was no significant correlation between physicians’ ratings of prognosis and HADS depression scores.

Follow-up survival data could be obtained for all 81 nonparticipants and 572 (99.5%) of the 575 patients with valid baseline depression scores. During the 1-year follow-up period, 14 (17.3%) of the study nonparticipants and 86 (15.0%) of the participants died. This small group difference was statistically insignificant. The following analyses can therefore be confined to the patients with complete HADS depression scores.

3. Results

3.1. Sample characteristics

The baseline characteristics of the patient sample are displayed in Table 1. The mean age of the study group was 59 years. The majority of the patients were male. About two thirds were married. More than half had a principal diagnosis of cardiopulmonary disease. Twenty-two percent had abnormal depression scores. The median Charlson comorbidity score was 2.

### Table 1 Baseline characteristics of the 575 medical inpatients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean±S.D. (years)</td>
<td>59.0±15.7</td>
</tr>
<tr>
<td>Sex†</td>
<td>Male 329 (57.2 %)</td>
</tr>
<tr>
<td></td>
<td>Female 246 (42.8 %)</td>
</tr>
<tr>
<td>Marital status‡</td>
<td>Unmarried 64 (11.1 %)</td>
</tr>
<tr>
<td></td>
<td>Married 388 (67.5 %)</td>
</tr>
<tr>
<td></td>
<td>Divorced 34 (5.9 %)</td>
</tr>
<tr>
<td></td>
<td>Widowed 74 (12.9%)*</td>
</tr>
<tr>
<td>Social integration‡</td>
<td>Good 449 (78.1 %)</td>
</tr>
<tr>
<td></td>
<td>Moderate 101 (17.6 %)</td>
</tr>
<tr>
<td></td>
<td>Poor 9 (1.6%)*</td>
</tr>
<tr>
<td>Principal diagnosis§</td>
<td>Hemato-oncological 103 (17.9 %)</td>
</tr>
<tr>
<td></td>
<td>Cardio-pulmonary 340 (59.1 %)</td>
</tr>
<tr>
<td></td>
<td>Gastrointestinal 80 (13.9 %)</td>
</tr>
<tr>
<td></td>
<td>Others 52 (9.0 %)</td>
</tr>
<tr>
<td>Charlson comorbidity score§</td>
<td>2 (1–3)</td>
</tr>
<tr>
<td>No. of other comorbid diagnoses§</td>
<td>3 (1–4)</td>
</tr>
<tr>
<td>Physician’s rating of prognosis§</td>
<td>Good 207 (36.0 %)</td>
</tr>
<tr>
<td></td>
<td>Intermediate 249 (43.3 %)</td>
</tr>
<tr>
<td></td>
<td>Poor 117 (20.3%)*</td>
</tr>
<tr>
<td>Body mass index (kg/m²)‡</td>
<td>25.2 (22.8–27.8)</td>
</tr>
<tr>
<td>Current alcohol consumption‡</td>
<td>None 338 (58.8 %)</td>
</tr>
<tr>
<td></td>
<td>Moderate 193 (33.6 %)</td>
</tr>
<tr>
<td>Smoking status‡</td>
<td>Nonsmokers 297 (51.7%)</td>
</tr>
<tr>
<td></td>
<td>Former smokers 131 (22.8%)</td>
</tr>
<tr>
<td></td>
<td>Current smokers 146 (25.4%)*</td>
</tr>
<tr>
<td>HADS depression‡</td>
<td>Normal (0–8) 450 (78.3 %)</td>
</tr>
<tr>
<td></td>
<td>Abnormal (9–21) 125 (21.7 %)</td>
</tr>
</tbody>
</table>

†Values represent n (%).
‡Values represent median (interquartile range).
§Difference to 575 (100%) due to missing data.

The univariate prediction of mortality has been examined in our previous study [1]. In brief, multiple predictors of mortality could be identified. Patients had an increased risk of death if they were older, had a principal diagnosis of hemato-oncological disease, a higher Charlson comorbidity score or a lower body mass index. Physicians’ ratings of prognosis were also strongly associated with mortality [unadjusted odds ratio (OR) for highest vs. lowest risk estimate 27.9; 95% confidence interval (CI):
HADS depression scores predicted mortality in two different analyses: patients who survived had significantly lower median HADS depression scores than those who were to die during the following year and they were also less likely to score above the predefined cutoff on the HADS.

### 3.3. Multivariate prediction of mortality

In our previous analysis, we could identify three independent somatic predictors of mortality, namely, physicians’ ratings of prognosis, a principal diagnosis of hemato-oncological disease and Charlson comorbidity scores. These were kept as control variables in the following analyses. None of the other somatic or sociodemographic baseline measures had independent predictive effects. For the current analyses, two regression models were computed as described above. In the first model (see Table 2), an additional independent effect could be observed for HADS depression item 1 (“I still enjoy things I used to enjoy/Definitely as much/not quite so much/only a little/hardly at all”). In contrast, HADS depression items 2–7 (Model 1) had no significant independent predictive effect. Similarly, in the second model, dichotomized HADS depression (Model 2) did not contribute significantly to the prediction of mortality if it was introduced together with depression item 1. Here it made no difference if the full depression score was used or a score derived from depression items 2–7 only.

Among the baseline variables shown in Table 1, only age and alcohol consumption were significantly associated with HADS depression item 1 after Bonferroni correction for multiple testing. Additional inclusion of these two variables did not add significant information to the regression models and left the effect of HADS depression item 1 unchanged.

HADS depression item 1 showed moderate correlations of 0.40–0.62 with the other HADS items asking for positive affect but only low correlations of around 0.3 with the negative affect items.

Adjusted survival curves for patients with different response categories on HADS depression item 1 (derived from Model 2) are shown in Fig. 1. These curves demonstrate that patients who felt completely unable to enjoy things had the highest mortality rates throughout the follow-up period, while there is a gradual increase in survival with increasing levels of positive responses to this item.

### Table 2

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model I HR*</th>
<th>95% CI</th>
<th>P</th>
<th>Model II HR*</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians’ ratings of prognosis</td>
<td>3.3</td>
<td>(2.3–4.9)</td>
<td>.0001</td>
<td>3.4</td>
<td>(2.3–5.0)</td>
<td>.0001</td>
</tr>
<tr>
<td>Principal diagnosis of hemato-oncological disease</td>
<td>2.5</td>
<td>(1.5–4.0)</td>
<td>.02</td>
<td>2.6</td>
<td>(1.6–4.1)</td>
<td>.0001</td>
</tr>
<tr>
<td>Charlson comorbidity scores</td>
<td>1.2</td>
<td>(1.0–1.3)</td>
<td>.007</td>
<td>1.1</td>
<td>(1.0–1.3)</td>
<td>.02</td>
</tr>
<tr>
<td>HADS depression item</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.4</td>
<td>(1.0–1.9)</td>
<td>.03</td>
<td>1.7</td>
<td>(1.2–2.3)</td>
<td>.001</td>
</tr>
<tr>
<td>2</td>
<td>1.0</td>
<td>(0.7–1.4)</td>
<td>.9</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>1.2</td>
<td>(0.8–1.6)</td>
<td>.4</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>0.9</td>
<td>(0.7–1.2)</td>
<td>.6</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>1.0</td>
<td>(0.8–1.4)</td>
<td>.9</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>1.0</td>
<td>(0.8–1.4)</td>
<td>.8</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>1.1</td>
<td>(0.8–1.5)</td>
<td>.6</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Positive HADS depression score</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>(0.4–1.5)</td>
<td>.5</td>
</tr>
</tbody>
</table>

* OR=multivariate hazard ratio; CI=confidence interval; P=significance level.

Item contents: (1) “I still enjoy things I used to enjoy”; (2) “I can laugh and see the funny side of things”; (3) “I feel cheerful”; (4) “I feel as if I am slowed down”; (5) “I have lost interest in my appearance”; (6) “I look forward with enjoyment to things”; (7) “I can enjoy a good book or radio or television programme.”

Model 1: Physicians’ ratings of prognosis, a principal diagnosis of hemato-oncological disease and Charlson comorbidity scores, and the raw values of each HADS depression item were entered simultaneously in a Cox regression analysis.

Model 2: HADS depression (dichotomized at the predefined cutoff) and HADS depression item 1 were added to physicians’ ratings of prognosis, a principal diagnosis of hemato-oncological disease and Charlson comorbidity scores.

11.5–68.0. HADS depression scores predicted mortality in two different analyses: patients who survived had significantly lower median HADS depression scores than those who were to die during the following year and they were also less likely to score above the predefined cutoff on the HADS.

Fig. 1. Influence of HADS depression item 1 on mortality.
4. Discussion

4.1. Main findings

Our present results suggest that one single item on positive affect independently predicts 1-year mortality in consecutively admitted medical inpatients. Interestingly, this item has a stronger association with mortality than the HADS items indicating negative affect or the presence of depressed mood. The present study also confirms that the degree of conserved positive affect in the face of severe physical illness was gradually related to survival in a dose–response pattern and that different levels of positive affect discriminated patients with different mortality rates throughout the follow-up period. In fact, survival curves continued to diverge with longer duration of follow-up, indicating that positive affect does not simply reflect better health at baseline but can also be considered a resource for medium-term survival.

4.2. Strengths and limitations

By achieving a sufficiently large sample size and a high participation and follow-up rate, our study sample was almost representative for all patients consecutively admitted to the participating medical wards, which increases the generalisability of the present results. Since emotional well-being is related to the physical status, emphasis was laid on controlling for physical comorbidity and disease severity. The three independent somatic predictors identified in our previous study could be confirmed in the present analyses.

Our study must be considered in light of several potential limitations: first, the reasons for better or worse emotional adjustment in our patients remain unclear. It would certainly be interesting to know more about social support networks, successful coping strategies and underlying personality traits such as self-efficacy. The answers might also have been influenced by experiences made over the last days preceding the completion of the questionnaire. However, patients were well comparable in terms of having been admitted to the hospital within 1 or 2 days before inclusion in the study. Furthermore, reverse causation was made even more unlikely by additional analyses of the subgroup surviving at least 4 months after baseline assessment. These analyses showed that the predictive effect of conserved positive affect even increased slightly and remained highly significant (results not shown). Third, despite some theoretical possibility, our results do not allow to conclude that the link between positive affect and survival is a causal one. It is possible that there is residual confounding by unmeasured aspects of disease severity or that some unmeasured additional variable (e.g., a genetic factor, personality trait or characteristic of the social environment) accounts for both greater positive affect and reduced risk of mortality. Fourth, we cannot answer the question of how and to what extent the dynamics of change in positive affect influence survival, since we administered the HADS only once at baseline.

4.3. Comparison with the literature

In our previous study of the same sample, we confirmed an independent effect of depressed mood on mortality. Our current study does not contradict these results as it rather has the purpose to complement them by identifying specific ingredients of depression that are related to mortality. Loss of positive affect seems to be the most important depression-related predictor of mortality or — vice versa — conserved positive affect despite the threat of physical illness is a potent predictor of survival, and, in fact, in our sample there was no independent contribution of any of the other HADS depression items. Nevertheless, this result does not mean that conserved positive affect is nothing more than absence of depression. However, the exact interrelations between positive and negative affects in their effects on prognosis remain to be studied in future research.

Our findings are partly consistent with current literature describing the influence between healthy psychological functioning and health outcomes [6–11]. This relationship has been shown for patient groups with different clinical conditions such as AIDS [6] or cardiovascular diseases [8–10]. However, in other studies of patients receiving haemodialysis [22], coronary artery bypass [23] or inoperable cancer [24], no effect of positive affect could be shown, whereas in patients with renal disease [25] 4-year survival was even deteriorated if they were too happy.

While most previous studies have focused on relatively homogeneous samples of patients, little is known about the effect of positive affect on mortality in the typical mixed patient populations seen on general medical wards. To the best of our knowledge, this is the first study that demonstrates the effect of a single HADS item and in particular of an item indicating positive affect on mortality in a group of consecutively admitted medical patients.

However, the mechanisms through which a psychological state such as positive affect might influence health outcomes are unclear. It has been hypothesized that experimentally as well as naturally induced affective states may have an impact on immune parameters [26]. Rozanski and Kubzansky [27] suggest that positive emotions may reduce the atherogenic effects of conditions associated with chronic hyperarousal by reducing activation of neuroendocrine, cardiovascular and inflammatory processes. Moreover, positive emotions have been suggested to improve a variety of functions, like problem solving or the ability to mobilize social or other resources [28]. Eventually, conserved positive affect indicates or facilitates adjustment to chronic disease and may therefore contribute to a better prognosis. One might conclude that patients should be offered better psychosocial care, helping them to conserve their positive affects. However, the authors of a recently published review state that a positive attitude cannot be enforced. Moreover, the authors of that review point out that “tyrannical” positive thinking could even increase the risk of maladjustment [29].
4.4. Implications for practice and research

As suggested in our previous study [1], asking patients how they felt and asking doctors how they judged their patients’ prognosis appeared to be more effective than formal prognostic markers. In this heterogeneous patient sample, individual resilience could be reflected better by positive emotional processes as compared to current pathology-oriented indices. This might be an additional argument for strengthening a person-centred approach to medical patients in clinical practice and research. This approach could include aspects of emotional well-being such as positive affect that might serve physicians as prognostic indicators and as a sphere of action in terms of strengthening positive life energies. Future research could further elaborate on development of positive affect measures and their prognostic power in medically ill patients. It could also disentangle the still poorly understood interrelationships between positive and negative affects in their effects on prognosis.

References