Psychology & Health, 2016
Vol. 31, No. 4, 470–486, http://dx.doi.org/10.1080/08870446.2015.1111369

Routledge
Taylor & Francis Group

Psychological predictors for health-related quality of life and disability in persons with chronic obstructive pulmonary disease (COPD)

Ricarda Mewes[a]*, Winfried Rief[a], Klaus Kenn[b], Jens Ried[c] and Nikola Stenzel[d]

[a]*Division of Clinical Psychology and Psychotherapy, Department of Psychology, Philipps-University of Marburg, Marburg, Germany;* [b]*Department of Pneumology, Allergology and Sleep Medicine, Schön Klinik Berchtesgadener Land, Schönau am Königssee, Germany;* [c]*Department of Theology, Division of Systematic Theology II, Friedrich-Alexander-University Erlangen-Nürnberg, Erlangen, Germany;* [d]*Division of Clinical Psychology and Psychotherapy, University of Leipzig, Leipzig, Germany*

(*Received 30 January 2015; accepted 15 October 2015*)

Objective: Individuals with chronic obstructive pulmonary disease (COPD) exhibit low physical and mental health-related quality of life (HRQL) and high susceptibility to disability. We investigated the influence of psychological factors on HRQL and disability in COPD individuals recruited from the general population. In line with Leventhal's common sense model, we expected psychological factors to be associated with HRQL and disability even after controlling for medical status.
Methods: Individuals with COPD ($n = 502$; 59.7 years old; GOLD grades were I: 3%, II: 17%, III: 34%, IV: 46%) were assessed through an online survey administered via COPD patient organisations in Germany. Individuals filled in the Short Form Health Survey (SF-12), COPD Assessment Test, Patient Health Questionnaire (modules: GAD-2, PHQ-15, PHQ-9), Brief Illness Perception Questionnaire, a questionnaire that assesses causal illness attributions, and the internal illness-related locus of control scale of the 'KKG questionnaire for the assessment of control beliefs about illness and health'. Multiple linear regressions were calculated.
Results: The investigated factors explained high variances (disability = 56%, physical HRQL = 28%, mental HRQL = 63%, $p \leq .001$). Better mental health, more optimistic illness perceptions, attribution to psychological causes, and stronger internal locus of control were associated with lower disability and better HRQL. Comorbid somatic symptoms contributed to high disability and low quality of life.
Conclusion: Psychological factors, such as illness perception, attribution and internal locus of control, were associated with disability and HRQL. These factors should be considered when designing treatments for individuals with COPD, and adequate interventions should be provided to enhance illness understanding and self-management skills.

Keywords: chronic obstructive pulmonary disease (COPD); health-related quality of life (HRQL); disability; comorbid somatic symptoms; causal illness attribution; internal locus of control

*Corresponding author. Email: mewesr@uni-marburg.de

Introduction

Chronic obstructive pulmonary disease (COPD) is characterised by progressive airflow limitations that are associated with an abnormal inflammatory response of the lung to noxious particles or gases (Rabe et al., 2007). The main symptoms of the disease are severe shortness of breath and coughing, which cause serious impairment, such as a reduction of general performance and functioning in daily activities (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006; Mannino & Buist, 2007). The prevalence of COPD in the US is estimated at around 20%, a rate that steadily increases (Buist et al., 2007). COPD was also ranked third in the global incidence of disease-related deaths in 2010 (Lozano et al., 2012). Furthermore, this illness is predicted to become the fourth leading cause of death and the seventh leading cause of loss from disability-adjusted life worldwide in 2030 (Mathers & Loncar, 2006).

Given the progressive and fatal course of COPD, maintaining quality of life and staving off individuals' disability for as long a period as possible are two primary goals of care. These individuals, however, exhibit low physical and mental health-related quality of life (HRQL; i.e. the effects of illnesses on people's moods and the manner by which they accomplish daily activities) and high susceptibility to disability (Buckley et al., 2013; DiBonaventura et al., 2012). This situation highlights the need for research to improve HRQL and reduce disability amongst individuals with COPD by probing into the factors that determine these negative conditions.

Studies in individuals with COPD consistently show that disability and HRQL are influenced primarily by psychological factors, as well as by objective severity indicators and socio-demographic variables (Hynninen, Breitve, Wiborg, Pallesen, & Nordhus, 2005; Jones, Miravitlles, van der Molen, & Kulich, 2012; Mackenbach, Borsboom, Nusselder, Looman, & Schrijvers, 2001; Scharloo, Kaptein, Weinman, Willems, & Rooijmans, 2000). With his common sense model, Leventhal proposes that effectively adapting to and coping with a chronic illness depend on five components: (1) the assumed identity of experienced symptoms, that is, lay assumptions about which symptoms reflect a given condition and the name or label that an individual assigns to his or her condition; (2) the assumed causes of the condition, regardless of whether these assumptions are biomedically sound; (3) the assumed duration of the condition; (4) the assumed consequences of the condition and its effects on a person's life; and (5) the curability and controllability of the condition by biomedical or personal means (Fischer et al., 2010; Hale, Treharne, & Kitas, 2007; Leventhal, Brissette, & Leventhal, 2003). As indicated in the model, illness perceptions, such as beliefs about the consequences and outcomes of COPD, affect the HRQL of individuals suffering from the disease (Kaptein et al., 2008; Scharloo et al., 2007; Zoeckler, Kenn, Kuehl, Stenzel, & Rief, 2014). This insight was extended by a recent study that reveals an association between high causal attribution to psychological factors, on the one hand, and low HRQL and high depression, on the other hand, in patients with COPD (Hoth, Wamboldt, Bowler, Make, & Holm, 2011). Furthermore, studies on individuals with other chronic illnesses underline the importance of the internal health-related locus of control, that is, the belief that the course of an illness depends on one's own behaviour (Rotter, 1966). Internal locus of control is associated with high HRQL, low depression and high resilience (Birmelé, Le Gall, Sautenet, Aguerre, & Camus, 2012; Matuz, Birbaumer, Hautzinger, & Kubler, 2010; Préau et al., 2005; Stewart & Yuen, 2011; Theofilou, 2012). Given the

criticality of this factor in the physical and mental HRQL observed in individuals with other chronic illnesses, it may also determine HRQL and disability in individuals with COPD.

In line with the assumed negative effect of a strong illness identity and a pessimistic illness perception in Leventhal's common sense model, comorbid mental disorders (e.g. depression and anxiety) and somatic symptoms strongly influence HRQL and increase disability in individuals with COPD and other chronic diseases (Baune, Adrian, & Jacobi, 2007; Blakemore et al., 2014; Di Marco et al., 2006; Kuhl, Schurmann, & Rief, 2008; Merikangas et al., 2007; Siebeling et al., 2014).

Despite the relevance of HRQL and disability to individuals with COPD, to our best knowledge, no previous study has thus far examined all the proposed factors in the common sense model when investigating individuals suffering from the illness. Research has also hitherto focused on small samples (i.e. less than 100 persons) comprising inpatients or outpatients. Small sample sizes may reduce the power with which additional meaningful HRQL or disability influencing factors is detected and hinder the use of regression that considers the relationship amongst different variables. Moreover, recruiting participants from inpatient units, during doctor's visits or from the waiting rooms of outpatient departments may limit the generalisability of results to individuals suffering from COPD. Such sampling techniques may neglect individuals who have been coping well with their COPD (e.g. persons handling their symptoms mainly by themselves, individuals who are active and physically fit or persons who do not worry about their symptoms) and who seldom visit a doctor.

Given the above-mentioned considerations, this study investigated the differential effects of psychological factors on HRQL and disability in a large sample of individuals with COPD recruited from the general population. In accordance with the common sense model, we expected psychological factors to be associated with HRQL and disability even after controlling for medical status via GOLD classification of COPD. Specifically, we hypothesised that a high internal locus of control and optimistic illness perceptions would be associated with high HRQL and low disability. By contrast, poor mental health and troublesome comorbid somatic symptoms would be associated with low HRQL and high disability. High attribution to psychological factors as the causes of COPD should also be related to low HRQL.

Methods

Data were collected between May and September 2012 through a cross-sectional online survey. No financial incentives were offered to the participants, and participation was voluntary. The study was approved by the local ethics committee of the Department of Psychology at the University of XXX (reference number 2012-02 K), and informed consent was obtained from all the participants.

Individuals with self-reported COPD were recruited via the websites of patient organisations and support groups for COPD in Germany (organisational information distributed by XXX Deutschland). The participants with a self-reported diagnosis of COPD and were able to answer a computer-based German questionnaire were included in the study; no other inclusion criteria were applied. In Germany, every patient with COPD is informed about his/her GOLD grade [in accordance with the *Global Initiative for Chronic Obstructive Lung Disease* (GOLD), 2015; grades range from I = mild to

IV = very severe] by a physician. Thus, most of the participants were aware of their GOLD grades. Participants who were uncertain about this information were encouraged to ask their physicians about their GOLD grades or to choose the answer 'GOLD grade unknown' and then carry on with the survey. The 113 participants who chose the answer 'GOLD grade unknown' were excluded from the analyses to avoid the potential inclusion of non-COPD patients. Individuals with an alpha-1-antitrypsin deficiency and individuals who had already participated in this study were also excluded. The final sample comprised 502 individuals. The participants were allowed to complete the survey at their own pace, but they could continue on to succeeding pages of the questionnaires only after completing every item on a page.

Questionnaires

Health-related quality of life (HRQL) was assessed with the 12-item Short Form Health Survey (SF-12) (Bullinger & Kirchberger, 1998). The SF-12 is a well-documented scoring system that is extensively used and validated as a quality-of-life assessment tool for the general population and for patients with chronic diseases. There were two main reasons that this instrument was chosen over a COPD-specific questionnaire, such as the St. George's Respiratory Questionnaire or the Chronic Respiratory Questionnaire. First, it was aimed to improve comparability to studies on individuals with other chronic illnesses, for which the influencing factors for quality of life that were investigated are similar to those considered in our study (see Introduction). In addition, comparability to recent studies that assessed the general HRQL of individuals with COPD should be improved (e.g. Buckley et al., 2013; DiBonaventura et al., 2012; Zoeckler et al., 2014). Second, the decision to choose the SF-12 was likewise dictated by time constraints. In online surveys, short durations are essential to achieve a high participation rate, particularly when the sample includes highly disabled persons who are able to fill in only short questionnaires. Another reason was the aim to include individuals who present minor symptoms; the Chronic Respiratory Questionnaire may not be ideal for such individuals (Jones et al., 2012). The scales of the SF-12 are summarised into two dimensions: physical health (Physical Component Summary Score) and mental health (Mental Component Summary Score). Both dimensions have an arithmetic mean at 50 and a standard deviation of 10. Higher scores indicate better HRQL. A drawback to the SF-12 is that because of the varying answer formats and the highly complicated analysis syntax, the reliability of the instrument cannot be definitively determined. However, the internal consistency of the mother questionnaire of the SF-12, the 36-item Short Form Health Survey (SF-36), was mostly high, with Cronbach's $\alpha \geq .80$ in different studies (Bullinger & Kirchberger, 1998). Considering that the items of the SF-12 are very similar to the SF-36 and that it explains 80–85% of the variance of the SF-36, the reliability of the SF-12 might be equally high.

COPD-related disability, i.e. the effect of COPD on health status and daily life, was assessed with the COPD Assessment Test (CAT) (Jones et al., 2009). This questionnaire consists of eight items, each formatted as a semantic differential scale with categories ranging from 0 (e.g. 'I never cough'.) to 5 (e.g. 'I cough all the time'.). The instrument shows good reliability and validity (Cronbach's $\alpha = .88$; test–retest in stable patients $r_{ICC} = .8$; correlations with the St. George's Respiratory Questionnaire $r = .8$; Jones et al., 2009). Overall, the CAT provides a valid, reliable and standardised measure for

COPD-related health status (Jones et al., 2009). In this study, we calculated a sum score, which ranged from 0 to 40. The Cronbach's α of the CAT in the present sample was .81.

Depression, anxiety and *somatic symptoms* were measured by the Patient Health Questionnaire (PHQ) (Kroenke, Spitzer, & Williams, 2001, 2002), which has nine items designed to assess depressive symptoms (PHQ-9). The PHQ-9 has shown high sensitivity and specificity in the diagnosis of depression (Henkel et al., 2003; Wittkampf, Naeije, Schene, Huyser, & van Weert, 2007). The response categories for the nine items range from 0 ('not at all') to 3 ('nearly every day'). In this work, a continuous depression score (the sum of the responses to the nine items) was calculated, and the score ranged from 0 to 27. The Cronbach's α of the PHQ-9 in the present sample was .88.

Two items of the PHQ (GAD-2) also assess general anxiety symptoms. The response categories for these items range from 0 ('not at all') to 2 ('more than half of the days'). Again, a continuous anxiety score was calculated by taking the sum of the responses to the two items, and the score ranged from 0 to 4. The Cronbach's α of this questionnaire in the present sample was .80.

Comorbid somatic symptoms (i.e. typical symptoms of comorbid illnesses and frequent complaints in daily life) were assessed with the PHQ-15 subscale, which is a checklist of 15 somatic symptoms typical for primary care patients. The PHQ-15 assesses a broad range of pain symptoms, shortness of breath, heart palpitation, dizziness and gastrointestinal complaints. The items 'pain associated with menstruation', 'pain during sexual intercourse' and 'faints' were excluded because (a) reference to highly private matters can result in high dropouts and (b) both low factor loadings on an extracted factor and inter-item correlations (Mewes et al., 2010). These issues were also considered minimally relevant to the investigated group. 'Shortness of breath' was another item that was excluded because it is a main symptom of COPD and not a comorbid symptom. For the last 4 weeks of the data collection period, the severity of each symptom was rated from 0 ('not bothered at all') to 2 ('bothered a lot') (Kroenke, Spitzer, deGruy, & Swindle, 1998; Kroenke, Spitzer, Williams, & Löwe, 2010). In the original PHQ-15, the total score ranges from 0 to 30 (Kroenke, Spitzer, deGruy, & Swindle, 1998; Kroenke et al., 2010), but in this work, the total score ranged from 0 to 22 owing to the reduction of instrument items to 11. The Cronbach's alpha of the questionnaire used in this study was .82.

Illness perception was assessed by the Brief Illness Perception Questionnaire (Brief-IPQ) (Broadbent, Petrie, Main, & Weinman, 2006). The Brief-IPQ assesses the subjective illness concept and the cognitive representations of an illness by using one item for each scale of the more detailed IPQ-Revised Questionnaire (Moss-Morris et al., 2002). This instrument has been validated in persons with different chronic illnesses (asthma, amongst others) and shows good test–retest reliability, as well as good concurrent validity and discriminant validity in terms of distinguishing different illnesses (Broadbent et al., 2006). Fischer et al. (2010) used the IPQ-R to determine the dynamics of illness representations in patients with COPD, and Kale et al. (2015) employed the Brief-IPQ to assess illness beliefs in patients with COPD.

We adapted the Brief-IPQ to the evaluation of the illness representation of COPD by replacing 'illness' with 'COPD' in each question. The adapted version assesses the assumed consequences of COPD, expected course of the illness, perceived personal

control over COPD, expected treatment benefits, experience of COPD symptoms, worries over COPD, understanding of the disease and emotional responses to COPD (i.e. feeling angry or anxious because of COPD). The response categories for these items range from 0 to 10, in which endpoints are labelled in accordance with the questions. For instance, 'How much does your COPD affect your life?' are assigned the endpoints 0 ('no affect at all') to 10 ('severely affects my life'). Scores range from 0 to 80, and higher values indicate a more pessimistic and threatening illness perception. The Cronbach's α of the questionnaire was .66, indicating acceptable reliability.

Causal illness attributions for COPD were assessed with a list of 12 possible causes (e.g. somatic/biomedical cause, age, stress, worries and general physical weakness) based on the questionnaire of Rief, Nanke, Emmerich, Bender, and Zech (2004). This questionnaire was developed to assess different dimensions of causal illness attributions in persons with medically unexplained symptoms and different comorbidities (Rief et al., 2004). To enhance suitability to individuals with COPD, we added 'smoking' as a possible cause and merged 'weather' and 'environmental factors' into a single item. For each cause, participants indicate to what extent they believe a given cause is responsible for the development of their COPD. The answer scale ranges from 0 ('not at all') to 10 ('very strong'). However, the dimensions of causal illness attributions can differ between illnesses. To determine the more general dimensions of illness attributions that are suitable to individuals with COPD, the data in this study were subjected to a principal axis factor analysis. The items in the data-set yielded a very high Kaiser–Meyer–Olkin value of .90. The Bartlett test for sphericity was significant [chi^2 (55) = 2625.2, $p \leq .001$], indicating that the variables are appropriate for a factor analysis. 'Smoking' was later excluded from the analysis because of the very low communality (.06) and high skewness (>2) and kurtosis (>3) of this item. The eigenvalues favoured a two-factor solution, with the first factor ('stress') explaining 48% of the variance and the second factor ('somatic/biomedical causes') explaining 11%. An analysis with varimax rotation was conducted under the assumption that the resultant factors are independent of one another. Independence of illness attributions has been shown in the literature on somatic symptoms (Rief et al., 2004). The two resultant factors were (1) 'stress', with the items 'mental stress', 'weak/overstrung nerves', 'physical overload', 'stress and bustle' and 'excessive worrying' and (2) 'somatic/biomedical causes', with the items 'somatic cause', 'environmental factors', 'virus or bacteria' and 'general physical weakness'. 'Aging' was excluded because it presented similar high loadings on both factors. Mean values were calculated for every factor, with a possible range of 0 to 10. The Cronbach's α values of the stress and somatic/biomedical scales were .91 and .70, respectively.

Finally, the internal locus of control subscale of the 'KKG questionnaire for the assessment of control beliefs about illness and health' (Lohaus & Schmitt, 1989) was used to assess *internal illness-related locus of control*. The Brief-IPQ provides only two items that inquire into personal and treatment control, whereas the KKG (*Kontrollüberzeugungen zu Krankheit und Gesundheit*, German for 'health locus of control beliefs') amplifies the assessment by measuring internal locus of control with seven items. The response options for these items range from 1 ('not at all') to 6 ('fully agree'). The mean score of the seven items was calculated, with a possible range of 1 to 6. High values indicate high conviction regarding internal locus of control. The KKG was developed in Germany and was evaluated with different samples of healthy and

chronically ill persons (with asthma or diabetes mellitus, amongst others) (Lohaus & Schmitt, 1989). The composition of the internal locus of control subscale was underlined by the results of a principal component factor analysis. The subscale showed acceptable to good internal consistency (Cronbach's $\alpha = .76$ and test–retest reliability = .72) for these samples. The Cronbach's α of the questionnaire in the present work was .78.

Statistics

The analyses were conducted with SPSS 18. First, a principal axis factor analysis was run for the questionnaire that assesses causal illness attributions (see *Causal illness attribution*s in the Questionnaires section for the proceeding). Means and standard deviations were then analysed. Finally, we conducted three stepwise multiple linear regression analyses, each with one of the following dependent variables: COPD-related disability (CAT), physical HRQL (SF-12 Physical Component Summary Score) and mental HRQL (SF-12 Mental Component Summary Score). The independent variables were age, sex, marital status, education, GOLD grade, depression, anxiety, comorbid somatic symptoms (PHQ, excluding 'shortness of breath'), illness perception (Brief-IPQ), causal illness attributions ('stress', 'somatic/biomedical causes' and 'smoking') and internal illness-related locus of control (KKG). Multicollinearity was controlled by means of tolerance (TOL < .10) and variance inflation factor (VIF > 10). On the basis of these criteria, none of the analysed variables showed multicollinearity. Predictors with $\alpha < .05$ were integrated in the final model. In addition, 95% confidence intervals for the unstandardised regression coefficients were calculated (see the result tables). With 502 participants, even a small increase in the variance (i.e. $f^2 = .03$) in a linear regression analysis can be detected with a power ($1 - \beta$) of at least .95.

Results

Sample

As previously stated, the analysed sample consisted of 502 individuals with COPD (Table 1). The participants are, on average, 59.7 ± 8.7 years old, and most of them are retired. As indicated by the GOLD grade, the severity of COPD is high or very high in most of the participants. Amongst the participants, 40% ($n = 200$) depended on long-term oxygen support. Nevertheless, 16% ($n = 80$) reported that they were still smoking, only 5% ($n = 26$) have never smoked and the rest had quit smoking. Almost all the participants identified smoking as the main cause of their COPD.

Descriptive data on HRQL, disability and other investigated variables

The investigated sample showed strong impairment by symptoms of depression and anxiety as well as somatic symptoms (see Table 2). Accordingly, the mental HRQL of the investigated sample (SF-12 Mental Component Summary Score) was low, and the physical HRQL was even lower (SF-12 Physical Component Summary Score) while the COPD-related disability was high. The illness perception of the COPD was mostly

Table 1. Sample description: socio-demographic data and clinical information.

Variable	% (n)/Mean ± SD; range
Age (years)	59.7 ± 8.7 (range: 30–82)
Sex	
Women	53% (n = 268)
Men	47% (n = 234)
Relationship status	
Married or in stable partnership	69% (n = 347)
Divorced	18% (n = 92)
Single	7% (n = 35)
Widowed	6% (n = 28)
Employment status	
Retired	60% (n = 301)
Working full- or part-time	20% (n = 98)
Others (e.g. housewife/-men; unemployed)	20% (n = 103)
GOLD grade	
I (mild)	3% (n = 15)
II (moderate)	17% (n = 84)
III (severe)	34% (n = 171)
IV (very severe)	46% (n = 232)

Table 2. Descriptive data on health-related quality of life, disability and the other investigated variables.

Variable	Mean ± SD; range
Health-related quality of life (SF-12)	
Mental health	40.0 ± 11.9 (range: 10–67)
Physical health	30.2 ± 8.3 (range: 12–58)
COPD-related disability (CAT)	23.4 ± 7.4 (range: 4–40)
Mental health, Somatic symptoms (PHQ)	
Depression	11.9 ± 6.4 (range: 0–27)
Anxiety	2.0 ± 1.3 (range: 0–4)
Comorbid somatic symptoms	10.8 ± 5.1 (range: 0–22)
Illness perception (Brief-IPQ)	49.3 ± 10.0 (range: 12–76)
Causal illness attribution	
Stress	2.8 ± 2.8 (range: 0–10)
Somatic/biomedical causes	3.6 ± 2.3 (range: 0–10)
Smoking	8.5 ± 2.8 (range: 0–10)
Internal illness-related locus of control (KKG)	3.7 ± 0.8 (range: 1–6)

threatening and its internal controllability was assumed to be little to moderate. Smoking was the strongest assumed cause for the COPD.

Predictors of COPD-related disability

About 56% of the variance in COPD-related disability was explained by five variables (Table 3): severity of depression, severity of comorbid somatic symptoms (PHQ,

Table 3. Predictors for COPD-related disability (CAT)[a].

	Explained variance (adjusted R^2)	Beta (95% confidence interval)	t	p
Depression (PHQ-9*)	.396	.26 (.16–.37)	4.8	≤.001
Comorbid somatic symptoms (PHQ)	.458	.55 (.43–.67)	8.8	≤.001
GOLD grade	.527	2.01 (1.47–2.54)	7.4	≤.001
Illness perception (IPQ**)	.557	.16 (.10–.21)	5.8	≤.001
Education	.563	−.56 (−1.01–−0.11)	−2.4	.015

[a]F(5494) = 127.1; $p \leq .001$; CAT = COPD Assessment Test.
*PHQ = Patient Health Questionnaire.
**IPQ = Brief-Illness Perception Questionnaire.

excluding 'shortness of breath'), GOLD grade, illness perception (B-IPQ) and education. The best predictors of disability were severity of comorbid somatic symptoms and depression, together explaining 46% of the variance; disability was higher under more severe somatic and depressive symptoms. Additionally, a higher GOLD grade, a more pessimistic illness perception and lower education were associated with higher COPD-related disability. Together, these variables explain an additional 10% of the variance.

Predictors of physical HRQL

Better physical HRQL was predicted by less severe comorbid somatic symptoms, lower GOLD grade, younger age, a more optimistic illness perception, higher anxiety, a higher attribution to stress causes, being married/in a stable relationship, higher education and a stronger internal illness-related locus of control; the last were only marginally significant (Table 4). Together, these nine variables explained 32% of the variance in

Table 4. Predictors for physical health-related quality of life (SF-12 physical component summary score)[b].

	Explained variance (adjusted R^2)	Beta (95% confidence interval)	t	p
Somatic symptoms (PHQ*)	.149	−.68 (−.83.–−.53)	−9.0	≤.001
GOLD grade	.229	−2.02 (−2.79–−1.25)	−5.2	≤.001
Age	.248	−.12 (-.19–−.05)	−3.2	≤.001
Illness perception (IPQ**)	.267	−.21 (.29–−.13)	−5.2	≤.001
Anxiety (GAD-2***)	.289	1.20 (.57–1.83)	3.7	≤.001
Causal attribution: stress	.299	.34 (.09–59)	2.7	.007
Marital status	.305	−.47 (-.87–−.08)	−2.4	.019
Education	.311	.66 (.03–1.30)	2.1	.041
Internal illness-related locus of control (KKG****)	.316	.77 (.02–1.52)	2.0	.046

[b]F(9, 490) = 25.18; $p \leq .001$.
*PHQ = Patient Health Questionnaire.
**IPQ = Brief-Illness Perception Questionnaire.
***Two items of the PHQ that assess general anxiety symptoms.
****KKG questionnaire for the assessment of control beliefs about illness and health.

physical HRQL. The last predictors only minimally contributed to the variance, but given the progressive course of COPD and associated burdens, even minor factors that improve quality of life may be important.

Surprisingly, anxiety was positively associated with HRQL; that is, higher nervousness, stress and worrying were related with better quality of life. The same was true for a higher causal attribution to stress. These results are discussed in the succeeding sections.

Predictors of mental HRQL

Depression, anxiety, illness perception and sex explained 63% of the variance in mental HRQL (Table 5). Mental HRQL was better under lower depression and anxiety and under optimistic illness perceptions. The men exhibited a slightly better mental HRQL than did the women.

Discussion

In line with Leventhal's common sense model, psychological factors (e.g. threatening illness perceptions and high depression) and troublesome somatic symptoms that may contribute to a strong illness identity were important predictors of low HRQL and high disability in individuals with COPD. Although a high GOLD grade was also predictive of high disability and low physical HRQL, it explained smaller variance than that accounted for by the psychological predictors and somatic symptoms.

Before discussing the results in more detail, an issue worth noting is that the mental and physical HRQL of the investigated sample was very low, equalling 25. percentile of a German comparison sample with chronic pulmonary diseases (Bullinger & Kirchberger, 1998). The mean value of COPD-related disability (CAT) was higher than that of the comparison sample, as determined from the validation study of the questionnaires (Jones et al., 2009; Kühl, Schürmann, & Rief, 2009). Nevertheless, this value falls within the range of the standard deviation. Both results indicate the high symptom

Table 5. Predictors for mental health-related quality of life (SF-12 mental component summary score)[c].

	Explained variance (adjusted R^2)	Beta (95% confidence interval)	t	p
Depression (PHQ-9*)	.521	−.68 (−.83–−.53)	−8.8	≤.001
Anxiety (GAD-2**)	.605	−3.46 (−4.2−−2.7)	−9.1	≤.001
Illness perception (IPQ***)	.625	−.21 (−.29−−.13)	−5.1	≤.001
Sex (1 = female, 2 = male)	.631	−1.88 (−3.2−−0.59)	−2.9	.005

[c]$F(4495) = 211.6$; $p \leq .001$.
*PHQ = Patient Health Questionnaire.
***Two items of the PHQ that assess general anxiety symptoms.
***IPQ = Brief-Illness Perception Questionnaire.

load of our sample, thus underlying the effect of the emerging predictors even for strongly impaired COPD individuals.

In agreement with Leventhal's assumption about the negative effect of a strong illness identity, one of the most important predictors of disability (explaining 6% of the variance) and physical HRQL (explaining 15% of the variance) was the severity of comorbid somatic symptoms (i.e. pain symptoms, heart palpitation, dizziness and gastrointestinal complaints). This finding accords with studies on patients with COPD and persons with other chronic diseases (Baune et al., 2007; Kuhl et al., 2008; Merikangas et al., 2007). These symptoms frequently occur in the general population, particularly in older people (Hessel, Beutel, Geyer, Schumacher, & Brähler, 2005; Hiller, Rief, & Brähler, 2006; Rief, Hessel, & Braehler, 2001). Although these somatic symptoms are not attributable to COPD in biomedical terms, lay persons with COPD may attribute them to their condition, thereby adding to a threatening illness perception. Moreover, they may be aggravated by a sedentary lifestyle and the loss of fitness in persons with COPD (e.g. as a consequence of the fear of aggravating breath limitations when moving) (Kuhl, Kuhn, Kenn, & Rief, 2010; O'Donnell et al., 2007). Our findings underscore the importance of preventing and treating these comorbid somatic symptoms to reduce disability and improve the physical quality of life of COPD patients.

Depression may aggravate a threatening illness perception and a sedentary lifestyle because it is characterised primarily by a negative world view, loss of drive and loss of pleasure in conducting activities. This may account for the high variance in disability explained by depression (40%). A somewhat counter-intuitive result is that on anxiety, for which the association with physical HRQL turned positive after the effects of other correlating variables (i.e. socio-demographic variables, somatic symptoms, GOLD grade, illness perception, causal attribution to stress and internal locus of control) were considered. This finding is either an indication of a statistical suppression effect or an artefact of the elimination of the variance in interrelated variables. Further research is needed to disentangle this finding.

Consistent with other studies (Baune et al., 2007; Blakemore et al., 2014; Kuhl et al., 2008; Merikangas et al., 2007; Siebeling et al., 2014), high depression and anxiety were the main predictors of low mental HRQL. These variables, together, explained 60% of the variance. Given the high relevance of mental HRQL and disability, adequate diagnosis and corresponding treatment of depression and anxiety should be a component of the general treatment for COPD (see also the *Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease*, Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2015, p. 50).

In accordance with the common sense model and studies on COPD patients (Kaptein et al., 2008; Scharloo et al., 2007; Zoeckler et al., 2014), a pessimistic illness perception was a predictor of high disability (explaining 3% of the variance) and low physical (explaining 1.9% of the variance) and mental (explaining 2% of the variance) HRQL. This result is supported by the findings of Scharloo et al. (2007), who also found an association between strong emotional reactions to COPD and low mental HRQL.

Contrary to Hoth et al. (2011), we found that attribution to psychological factors as COPD causes was associated with high physical HRQL. This result may be explained by the different psychological causes assessed; that is, the causes (e.g. emotional state, personality and mental attitude) evaluated in Hoth et al. (2011) may imply more

self-blaming, whereas the causes evaluated in our work (e.g. mental stress, physical overload, stress and bustle) may be associated with a feeling of higher self-control. For example, blame has been related to poor quality of life in women with breast cancer (Friedman et al., 2007). These controversial findings may also be attributed to differences in samples (patients from two hospitals vs. participants from the general population).

In correspondence with the considerable research on chronically ill individuals (Birmelé et al., 2012; Matuz et al., 2010; Préau et al., 2005; Stewart & Yuen, 2011; Theofilou, 2012), internal illness-related locus of control was a positive predictor of high physical HRQL in the present study. Nevertheless, the explained variance was minimal possibly because of the high disease severity in the investigated sample and the always fatal course of COPD. Considering these characteristics, the more general illness representation that includes treatment efficacy and emotional factors appears to be more relevant to individuals with COPD than the more specific internal illness-related locus of control.

In conclusion, additional psychological interventions may help improve illness perception. Examples of such interventions include psycho-education on symptoms that reflect or do not reflect COPD, self-management skills for relevant symptoms and guidelines on coping with the emotional consequences of the illness. Such programme may, in turn, reduce worrying and other negative effects, thereby possibly resulting in lower disability and improved HRQL (Blumenthal et al., 2014; Devine & Pearcy, 1996; see also *Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease*, Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2015).

Next to medical status and the psychological predictors, higher education, younger age and sex (male) were associated with higher HRQL and lower disability in the investigated sample. The association of younger age with higher HRQL is consistent with findings on general populations from different countries (Bobak, Kristenson, Pikhart, & Marmot, 2004). The higher HRQL in men than in women also agrees with previous findings on persons with COPD (Di Marco et al., 2006; Katsura, Yamada, Wakabayashi, & Kida, 2007). Some studies also show that female patients report higher levels of anxiety and depression, thus highlighting the specific role of gender differences in COPD (Di Marco et al., 2006). Such differences in general should therefore be accorded importance in the management plans for COPD.

The results of this study illuminate additional considerations concerning the possible implications of health care for individuals with COPD. In addition to pulmonary rehabilitation programmes or exercise training, the treatment of comorbid somatic symptoms is necessary to maintain a relatively low level of disability and a comparatively high level of HRQL. The presented outcomes, especially the findings on illness perception, highlight the need of individuals with COPD for additional support. A comprehensive treatment of COPD should comprise psychological tools that empower patients to regain and enhance self-efficacy and self-management. From an ethical point of view, educating individuals on strategies for coping with the everyday impairments caused by COPD is an essential aim of treating the disease. Such educational initiatives reinforce patients' capacity to live autonomously for as long a period as possible in accordance with present stage of illness.

Limitations

Although this study offers important contributions (e.g. general population approach, high statistical power, investigation of differential effects of important predictors), it is also encumbered by certain limitations.

First, the study was cross-sectional in nature. Therefore, only the associations between the assessed predictors and outcome variables could be determined. Conclusions on longitudinal predictive value and causal relationships amongst the investigated factors could not be drawn.

Second, the COPD diagnosis of our sample was self-reported and unconfirmed by a physician. We aimed to enhance the validity of the reported diagnosis by recruitment with the help of COPD-specific patient organisations and by excluding persons who could not indicate their GOLD grades. However, we cannot fully ascertain that only individuals with COPD participated in the study. Moreover, by excluding the individuals who did not know their GOLD grades, persons who are not as anxious about their illness or with less severe COPD may have been excluded to a higher degree. Such exclusion may have biased the results in favour of, for example, a strong association between anxiety and disability due to COPD.

Third, we used the early GOLD classification as a marker for the medical condition. This classification shows limited informative value; that is, patients with the same grade, for instance, may differ in clinical presentation (Jones, 2009). The goal of our study was to obtain information on the effects of several psychological factors, in addition to physiological conditions. Therefore, the early classification, which is based only on spirometric results, is regarded as appropriate.

Fourth, the use of the SF-12 as a general questionnaire for HRQL improved the comparability of the present results to studies on other chronic illnesses and recent research on the general HRQL of persons with COPD. It may also have enhanced the participation rate because the instrument can be completed in a short period. The investigation of a control group from the general population would have been helpful in detecting the specific effects of the investigated factors on the HRQL of individuals with COPD. However, the use of a general questionnaire for HRQL hindered the detailed assessment of aspects specific to the HRQL of persons with COPD, particular respiratory symptoms.

Furthermore, mental health was assessed via self-reporting. To ensure the validity of the assessed symptoms, only well-validated questionnaires were applied.

Conclusion

Better mental health, more optimistic illness perceptions, attribution to psychological causes and stronger internal locus of control were associated with lower disability and better HRQL in individuals with COPD even after accounting for medical status. Comorbid somatic symptoms contribute to high disability and low quality of life. Consequently, health care providers should take the investigated factors into account when designing treatments for persons with COPD and should provide adequate interventions to enhance illness understanding and self-management skills.

Acknowledgment

We thank SGH-Lungenemphysem Deutschland (patient organisation), especially Jens Lingemann, for supporting this study. He is the head of this patient organisation and administrator of the websites where the hyperlinks to the online survey were provided.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Baune, B. T., Adrian, I., & Jacobi, F. (2007). Medical disorders affect health outcome and general functioning depending on comorbid major depression in the general population. *Journal of Psychosomatic Research, 62*, 109–118.

Birmelé, B., Le Gall, A., Sautenet, B., Aguerre, C., & Camus, V. (2012). Clinical, sociodemographic, and psychological correlates of health-related quality of life in chronic hemodialysis patients. *Psychosomatics, 53*, 30–37.

Blakemore, A., Dickens, C., Guthrie, E., Bower, P., Kontopantelis, E., Afzal, C., & Coventry, P. A. (2014). Depression and anxiety predict health-related quality of life in chronic obstructive pulmonary disease: systematic review and meta-analysis. *International Journal of Chronic Obstructive Pulmonary Disease, 9*, 501–512. doi:10.2147/COPD.S58136

Blumenthal, J. A., Emery, C. F., Smith, P. J., Keefe, F. J., Welty-Wolf, K., Mabe, S., … Palmer, S. M. (2014). The effects of a telehealth coping skills intervention on outcomes in chronic obstructive pulmonary disease. *Psychosomatic Medicine, 76*, 581–592. doi:10.1097/PSY.0000000000000101

Bobak, M., Kristenson, M., Pikhart, H., & Marmot, M. (2004). Life span and disability: a cross sectional comparison of Russian and Swedish community based data. *BMJ, 329*, 767.

Broadbent, E., Petrie, K. J., Main, J., & Weinman, J. (2006). The brief illness perception questionnaire. *Journal of Psychosomatic Research, 60*, 631–637.

Buckley, J., Tucker, G., Hugo, G., Wittert, G., Adams, R. J., & Wilson, D. H. (2013). The Australian baby boomer population-factors influencing changes to health-related quality of life over time. *Journal of Aging and Health, 25*, 29–55.

Buist, A. S., McBurnie, M. A., Vollmer, W. M., Gillespie, S., Burney, P., Mannino, D. M., … Group, B. C. R. (2007). International variation in the prevalence of COPD (The BOLD Study): a population-based prevalence study. *The Lancet, 370*, 741–750. doi:10.1016/S0140-6736(07)61377-4

Bullinger, M., & Kirchberger, I. (1998). *SF-36 Fragebogen zum Gesundheitszustand*. Göttingen: Hogrefe.

Devine, E. C., & Pearcy, J. (1996). Meta-analysis of the effects of psychoeducational care in adults with chronic obstructive pulmonary disease. *Patient Education and Counseling, 29*, 167–178.

DiBonaventura, M., Paulose-Ram, R., Su, J., McDonald, M., Zou, K. H., Wagner, J. S., & Shah, H. (2012). The burden of chronic obstructive pulmonary disease among employed adults. *International Journal of Chronic Obstructive Pulmonary Disease, 7*, 211–219.

Di Marco, F., Verga, M., Reggente, M., Maria Casanova, F., Santus, P., Blasi, F., … Centanni, S. (2006). Anxiety and depression in COPD patients: The roles of gender and disease severity. *Respiratory Medicine, 100*, 1767–1774.

Fischer, M., Scharloo, M., Abbink, J., van ‘t Hul, A., van Ranst, D., Rudolphus, A., … Kaptein, A. A. (2010). The dynamics of illness perceptions: Testing assumptions of Leventhal’s

common-sense model in a pulmonary rehabilitation setting. *British Journal of Health Psychology, 15*, 887–903. doi:10.1348/135910710X492693

Friedman, L. C., Romero, C., Elledge, R., Chang, J., Kalidas, M., Dulay, M. F., … Osborne, C. K. (2007). Attribution of blame, self-forgiving attitude and psychological adjustment in women with breast cancer. *Journal of Behavioral Medicine, 30*, 351–357.

Global strategy for the diagnosis, management, and prevention of Chronic Obstructive Pulmonary Disease. (2015). Global Initiative for Chronic Obstructive Lung Disease.

Hale, E. D., Treharne, G. J., & Kitas, G. D. (2007). The common-sense model of self-regulation of health and illness: how can we use it to understand and respond to our patients' needs? *Rheumatology, 46*, 904–906. doi:10.1093/rheumatology/kem060

Henkel, V., Mergl, R., Kohnen, R., Maier, W., Moller, H. J., & Hegerl, U. (2003). Identifying depression in primary care: a comparison of different methods in a prospective cohort study. *BMJ, 326*, 200–201.

Hessel, A., Beutel, M., Geyer, M., Schumacher, J., & Brähler, E. (2005). Prevalence of somatoform pain complaints in the German population. *GMS Psychosoc Med, 2*.

Hiller, W., Rief, W., & Brähler, E. (2006). Somatization in the population: From mild bodily misperceptions to disabling symptoms. *Social Psychiatry and Psychiatric Epidemiology, 41*, 704–712.

Hoth, K. F., Wamboldt, F. S., Bowler, R., Make, B., & Holm, K. E. (2011). Attributions about cause of illness in chronic obstructive pulmonary disease. *Journal of Psychosomatic Research, 70*, 465–472.

Hynninen, K. M., Breitve, M. H., Wiborg, A. B., Pallesen, S., & Nordhus, I. H. (2005). Psychological characteristics of patients with chronic obstructive pulmonary disease: A review. *Journal of Psychosomatic Research, 59*, 429–443.

Jones, P. W. (2009). Health status and the spiral of decline. *COPD: Journal of Chronic Obstructive Pulmonary Disease, 6*, 59–63. doi:10.1080/15412550802587943

Jones, P. W., Harding, G., Berry, P., Wiklund, I., Chen, W. H., & Kline Leidy, N. (2009). Development and first validation of the COPD Assessment Test. *European Respiratory Journal, 34*, 648–654.

Jones, P., Miravitlles, M., van der Molen, T., & Kulich, K. (2012). Beyond FEV1 in COPD: a review of patient-reported outcomes and their measurement. *International Journal of Chronic Obstructive Pulmonary Disease, 7*, 697–709.

Kale, M. S., Federman, A. D., Krauskopf, K., Wolf, M., O'Conor, R., Martynenko, M., … Wisnivesky, J. P. (2015). The association of health literacy with illness and medication beliefs among patients with chronic obstructive pulmonary disease. *PLoS ONE, 10*, e0123937. doi:10.1371/journal.pone.0123937

Kaptein, A. A., Scharloo, M., Fischer, M. J., Snoei, L., Cameron, L. D., Sont, J. K., Weinman, J. (2008). Illness perceptions and copd: an emerging field for copd patient management. *Journal of Asthma, 45*, 625–629.

Katsura, H., Yamada, K., Wakabayashi, R., & Kida, K. (2007). Gender-associated differences in dyspnoea and health-related quality of life in patients with chronic obstructive pulmonary disease. *Respirology, 12*, 427–432.

Kroenke, K., Spitzer, R. L., deGruy, F. V. 3rd, & Swindle, R. (1998). A symptom checklist to screen for somatoform disorders in primary care. *Psychosomatics, 39*, 263–272.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*, 606–613.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2002). The PHQ-15: validity of a new measure for evaluating the severity of somatic symptoms. *Psychosomatic Medicine, 64*, 258–266.

Kroenke, K., Spitzer, R. L., Williams, J. B., & Löwe, B. (2010). The patient health questionnaire somatic, anxiety, and depressive symptom scales: A systematic review. *General Hospital Psychiatry, 32*, 345–359.

Kuhl, K., Schurmann, W., & Rief, W. (2008). Mental disorders and quality of life in COPD patients and their spouses. *International Journal of Chronic Obstructive Pulmonary Disease, 3*, 727–736.

Kuhl, K., Kuhn, C., Kenn, K., & Rief, W. (2010). The COPD-Anxiety-Questionnaire (CAF): A new instrument to assess illness specific anxiety in COPD patients. *Psychother Psychosom Med Psychol, 61*, e1–9.

Kühl, K., Schürmann, W., & Rief, W. (2009). COPD disability index (CDI) – a new instrument to assess COPD-related disability. *Pneumologie, 63*, 136–143.

Leventhal, H., Brissette, I., & Leventhal, E. (2003). The common-sense model of self-regulation of health and illness. In L. D. Cameron (Ed.), *The self-regulation of health and illness behaviour* (pp. 42–65). London: Routledge.

Lohaus, A., & Schmitt, G. M. (1989). Kontrollüberzeugungen zu Krankheit und Gesundheit (KKG): Bericht über die Entwicklung eines Testverfahrens [Locus of control about illness and health]. *Diagnostica, 35*, 59–72.

Lopez, A. D., Mathers, C. D., Ezzati, M., Jamison, D. T., & Murray, C. J. L. (2006). *Incorporating deaths near the time of birth into estimates of the global burden of disease*. Washington: The World Bank.

Lozano, R., Naghavi, M., Foreman, K., Lim, S., Shibuya, K., Aboyans, V., … Memish, Z. A. (2012). Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet, 380*, 2095–2128. doi:10.1016/S0140-6736(12)61728-0

Mackenbach, J. P., Borsboom, G. J., Nusselder, W. J., Looman, C. W., & Schrijvers, C. T. (2001). Determinants of levels and changes of physical functioning in chronically ill persons: Results from the GLOBE Study. *Journal of Epidemiology & Community Health, 55*, 631–638.

Mannino, D. M., & Buist, A. S. (2007). Global burden of COPD: risk factors, prevalence, and future trends. *The Lancet, 370*, 765–773.

Mathers, C. D., & Loncar, D. (2006). Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Medicine, 3*, e442.

Matuz, T., Birbaumer, N., Hautzinger, M., & Kubler, A. (2010). Coping with amyotrophic lateral sclerosis: an integrative view. *Journal of Neurology, Neurosurgery & Psychiatry, 81*, 893–898.

Merikangas, K. R., Ames, M., Cui, L., Stang, P. E., Ustun, T. B., Von Korff, M., & Kessler, R. C. (2007). The impact of comorbidity of mental and physical conditions on role disability in the US adult household population. *Archives of General Psychiatry, 64*, 1180–1188.

Mewes, R., Christ, O., Rief, W., Brähler, Elmar, Martin, A., & Glaesmer, Heide (2010). Sind Vergleiche im Depressions- und Somatisierungsausmaß zwischen Migranten und Deutschen möglich? [Are depression and somatisation equivalent for migrants and Germans? Measurement invariance for the PHQ-9 and PHQ-15]. *Diagnostica, 56*, 230–239.

Moss-Morris, R., Weinman, J., Petrie, K. J., Horne, R., Cameron, L. D., & Buick, D. (2002). The revised illness perception questionnaire (IPQ-R). *Psychology and Health, 17*, 1–16.

O'Donnell, D. E., Banzett, R. B., Carrieri-Kohlman, V., Casaburi, R., Davenport, P. W., Gandevia, S. C., … Webb, K. A. (2007). Pathophysiology of Dyspnea in chronic obstructive pulmonary disease: A Roundtable. *Proceedings of the American Thoracic Society, 4*, 145–168.

Préau, M., Vincent, E., Spire, B., Reliquet, V., Fournier, I., Michelet, C., … Morin, M. (2005). Health-related quality of life and health locus of control beliefs among HIV-infected treated patients. *Journal of Psychosomatic Research, 59*, 407–413.

Rabe, K. F., Hurd, S., Anzueto, A., Barnes, P. J., Buist, S. A., Calverley, P., … Zielinski, J. (2007). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. *American Journal of Respiratory and Critical Care Medicine, 176*, 532–555.

Rief, W., Hessel, A., & Braehler, E. (2001). Somatization symptoms and hypochondriacal features in the general population. *Psychosomatic Medicine, 63*, 595–602.

Rief, W., Nanke, A., Emmerich, J., Bender, A., & Zech, T. (2004). Causal illness attributions in somatoform disorders: associations with comorbidity and illness behavior. *Journal of Psychosomatic Research, 57*, 367–371.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied, 80*, 1–28.

Scharloo, M., Kaptein, A. A., Weinman, J. A., Willems, L. N., & Rooijmans, H. G. (2000). Physical and psychological correlates of functioning in patients with chronic obstructive pulmonary disease. *Journal of Asthma, 37*, 17–29.

Scharloo, M., Kaptein, A. A., Schlösser, M., Pouwels, H., Bel, E. H., Rabe, K. F., & Wouters, E. F. (2007). Illness perceptions and quality of life in patients with chronic obstructive pulmonary disease. *Journal of Asthma, 44*, 575–581.

Siebeling, L., Musoro, J. Z., Geskus, R. B., Zoller, M., Muggensturm, P., Frei, A., … ter Riet, G. (2014). Prediction of COPD-specific health-related quality of life in primary care COPD patients: a prospective cohort study. *NPJ Primary Care Respiratory Medicine, 24*, 14060. doi:10.1038/npjpcrm.2014.60

Stewart, D. E., & Yuen, T. (2011). A systematic review of resilience in the physically Ill. *Psychosomatics, 52*, 199–209.

Theofilou, P. (2012). Quality of life and mental health in hemodialysis and peritoneal dialysis patients: the role of health beliefs. *International Urology and Nephrology, 44*, 245–253.

Wittkampf, K. A., Naeije, L., Schene, A. H., Huyser, J., & van Weert, H. C. (2007). Diagnostic accuracy of the mood module of the Patient Health Questionnaire: A systematic review. *General Hospital Psychiatry, 29*, 388–395.

Zoeckler, N., Kenn, K., Kuehl, K., Stenzel, N., & Rief, W. (2014). Illness perceptions predict exercise capacity and psychological well-being after pulmonary rehabilitation in COPD patients. *Journal of Psychosomatic Research, 76*, 146–151.