

ORIGINAL ARTICLE

## Distress, quality of life, neuroticism and psychological coping are related in head and neck cancer patients during follow-up

ANNE K. H. AARSTAD<sup>1,2</sup>, ELISABETH BEISLAND<sup>2</sup>, ARILD ANDRÉ OSTHUS<sup>3</sup>  
& HANS J. AARSTAD<sup>1,3</sup>

<sup>1</sup>Department of Otolaryngology/Head and Neck Surgery, Haukeland University Hospital, Bergen, Norway,

<sup>2</sup>Faculty of Health and Social Sciences, Bergen University College, Bergen, Norway and <sup>3</sup>Department of Surgical Sciences, Faculty of Medicine, University of Bergen, Bergen, Norway

### Abstract

The aim of the present study was to study the relation between distress, quality of life (QoL), personality and choice of coping in successfully treated head and neck squamous cell carcinoma (HNSCC) patients, and to study whether distress could be regarded as a QoL variable. *Material and methods.* We determined present distress by the general health questionnaire (GHQ), QoL by the European Organization for Research and Treatment of Cancer Quality of life Questionnaire (EORTC-QLQ) C30/H&N35, personality by the Eysenck Personality Inventory and coping by the COPE questionnaire. All patients younger than 80 years who had been diagnosed with HNSCC in Western Norway in the period from 1992 to October 2001, and who had survived at least 12 months without evidence of disease were interviewed. In addition, treatment level, TNM stage, alcohol consumption level as well as smoking level were determined. One hundred and thirty-nine patients (96.5% response rate) were included. *Results.* Distress and QoL indexes were scored with a common variance (CV) between 20% and 35%. The measured variables account for 40–48% of the variance of the QoL/GHQ scores. Between 3% and 10% of the GHQ/general QoL scores and 10% of the variance of the H&N35 QoL scores were predicted by the TNM stage. The measured psychological factors accounted for 20% of the H&N35 QoL scores and 40% of the measured variance of the general QoL and GHQ responses. High neuroticism (CV=20–35%), present avoidance coping (CV=10–30%) and coping by suppression of competing activity (CV=10–20%) were associated with low QoL and high distress. *Conclusion.* GHQ and QoL scores are scored similar, and are to some extent predicted by treatment related factors, but between 2.5 and 10 times more closely associated with psychological factors. Distress may possibly also be regarded as a QoL variable.

To be diagnosed with, and treated for head and neck squamous cell carcinoma (HNSCC) must be a frightening experience [1]. Furthermore, life as a former HNSCC patient with fear of recurrence and new cancer disease [2], as well as experiencing sequels caused by the cancer treatment [3], place considerable demand on the patient. Most investigators, however, have shown that reported general health-related quality of life (HRQoL) [4–6] of surviving HNSCC patients is rather similar to that of a comparable general population. On the other hand, distress is reported to be high in former HNSCC patients [7–9].

Distress is a concept used more in psychological rather than medical research. Distress is defined as “an unpleasant emotional experience of a psychological, social, or spiritual nature. Distress extends

along a continuum, ranging from common normal feelings of vulnerability, sadness, and fear to problems that can become disabling, such as depression, anxiety, panic, social isolation, and spiritual crisis” (US National Comprehensive Cancer Network [10]). Distress may be measured by the “General Health Questionnaire” [11]. Level of distress may be used as an indicator of mental disease [7,12]. Distress is, however, overlapping with the QoL concept, both as to definition and when measured simultaneously [7,13]. We have thus found it pertinent to study to what extent distress may be regarded as a QoL variable.

Personality may be defined as those characteristics of the person that account for consistent patterns of feeling, thinking and behavior [14]. There are several approaches to conceptualizing personality.

The Eysenck's model [15] has, for example, formulated the personality dimension "Neuroticism". Neuroticism is a broad pervasive dimension of normal personality whereby people vary in their tendency to experience dysphoric emotional states [16]. Individuals with high scores on neuroticism are assumed to be predisposed to worry regardless of the presence or absence of threats, and to report more subjective health complaints than do stable individuals [16]. We and others have shown a close inverse association between level of neuroticism and level of QoL in HNSCC patients [17,18]. It has also been shown a similar general relation between distress and neuroticism [19]. We have furthermore shown that sense of humor predicted QoL [1]. We have therefore also aimed at to study the relation between distress and sense of humor.

Lazarus [20] defines coping as: "ongoing cognitive and behavioral efforts to manage specific external and/or internal demands that are judged to tax or exceed the resources of the person". Coping contributes to enable cancer patients to live with the demands posed by the disease, and experience general well being despite having been treated for cancer. The principal coping styles identified are problem-focused, emotional-focused and avoidance-focused coping style [21]. Problem-focused coping may be actively to do something to reduce the demand. Emotion-focused coping may be to change the attitudes towards the demand by social support or by a cognitive re-interpretation like: "I have grown as a human being because of having had cancer". Avoidance coping may be to behave, or to think, as if the cancer disease had never occurred [21]. Utilized coping is related to QoL [18] and distress [22,23] in a similar fashion.

Formal studies, including well defined cancer patient groups, where both QoL and distress levels have been obtained has so far been limited, and is warranted. We have studied to what extent personality, choice of coping, sense of humor, alcohol and tobacco use as well as TNM stage and tumor treatment level relate to distress and QoL in a cohort of patients successfully treated for HNSCC.

## Patients and methods

### Patients

We have included all patients diagnosed with HNSCC in Western Norway in the period from July 1, 1992 to October 1, 2001 and below 80 years of age (N=162) who had been disease free for at least one year following therapy by October 1, 2002. Interviews were conducted in the period from October 21, 2002 and March 29, 2004. Eighteen patients

were found not eligible for the study at the first interview time point. Three patients refused to participate and two were lost to follow-up. Table I shows the sites of the neoplasms and Table II the TNM stages of the included patients. The HNSCC treatment overview is given in Table I. At the inclusion time point, 31 of the patients were living alone. The mean age of the interviewed patients was  $60 \pm 12$  (mean  $\pm$  SD) years. One hundred and four males and 35 females were included.

### Tumor therapy

Radiation therapy was administered by two-dimensional external beam technique using 5 fractions (2.0 Gy) per week throughout the period. Neck dissection was performed unilateral or bilateral, as modified radical or supra-omohyoidal procedure.

The treatment record of each patient was reviewed. It was determined whether or not the patient had been subjected to local surgery, re-constructive flap surgery or neck dissection; all scored as no or yes (0/1) (Table I). Neck radiation therapy was scored on a scale where one point was added if radiated to each of the fields: high left, high right, lower neck. The maximum cumulative dose of radiation therapy to a specific site in each patient was registered and categorized into five levels. Whether given radiation therapy to the primary tumor site was scored as 0/1.

Table I. Primary tumor site, education level and treatment given of the included HNSCC patients.

Tumor primary site of the included patients		
Base of tongue (C01)		5
Tongue (C02)		21
Gingival (C03)		9
Oral cavity (C04-06)		13
Tonsil (C09)		24
Oro/hypopharynx (C10/12)		5
Sinus/nasal cavity/nasopharynx (C11/30-31)		6
Larynx (C32)		52
Met. unknown primary (C77)		3
Lung (C34)		1
Educational status of the included patients		
Primary school		31
Blue collar		38
Secondary school		16
High school		24
College		16
Master degree		14
Treatment given to the included patients		
	No	Yes
Primary tumor RT	44	95
Neck radiation therapy	72	67
Primary tumor surgery	53	86
Neck dissection	87	52
Flap reconstruction	123	16

### Quality of life inventory

The QoL was determined by employing the EORTC QLQ-C30 version 3.0 [24] and the EORTC QLQ-H&N35 aimed at HN cancer patients [25–27]. The answers were given according to a 4-point Likert format, except questions about general health and quality of life, which were given according to a 7-point Likert format. The indexes were scored according to the EORTC guidelines. The C-30 functional scales and the global scale were transformed so that 100% indicates best function and 0% least function of the individual QoL index whereas the C-30 symptom scales and the H&N35 scales were transformed so that 0% indicates least and 100% most symptoms.

The QLQ scores built up of more than one response were studied by Cronbach's  $\alpha$ . It was shown that all but the C30 cognitive, C30 physical functioning, C30 nausea and vomiting, the H&N35 "swallowing" and "speech" had values above 0.70 (results not shown).

Scores of each cluster were also subjected to reliability analysis. The QLQ-C30 functional scores had a Cronbach alpha of 0.78, the QLQ-C30 symptom scores had a Cronbach alpha of 0.79 and the QLQ-H&N35 score had a Cronbach alpha of 0.80. This shows that it is psychometrically valid to calculate sum scores.

### General Health Questionnaire

The general health questionnaire (GHQ)-30 was employed [11]. The patients scored according to a standard 4 point response matrix. The GHQ was analyzed with the responses calculated as Likert scores, and with case scoring indicating response category 1 and 2 scored as 1 and response category 3 and 4 scored as 2.

### Eysenck Personality Inventory

The neuroticism (24 questions) and lie score (9 questions) dimensions of the Eysenck personality questionnaire [28] were determined. The subject responds YES or NO to each question. The scales are calculated as sum scores.

The neuroticism scale consists of questions related to mental symptoms such as obsessive thoughts, anxiety, depression and low self esteem, but includes also somatic symptoms like muscle pain, tachycardia and sleeplessness. The scale assesses adjustment versus emotional instability and identifies individuals prone to psychological distress, unrealistic ideas, excessive cravings or urges and maladaptive coping responses. Individuals with low scores are characterized as calm, relaxed, unemotional and self-satisfied [13].

The lie scale is based on answers to 9 questions like: "Have you ever stolen anything?" Although originally introduced as a lie scale, it has later been suggested that the response pattern to this scale may be regarded as a measurement of a personality trait [29], possibly with a focus on handling of moral issues.

### COPE Inventory

Carver, Scheier and Weintraub [30] have developed the COPE questionnaire based on a conceptual framework by Lazarus [20]. The scores for each assessed coping indexes are calculated as the sum of the responses to four different questions that are scored according to a 4-point Likert format. The scales utilized assess the level of problem-focused coping (suppression of competing activity), emotional coping (seeking social support for emotional reasons), avoidance coping (behavioral disengagement). The subjects were asked to relate the responses to their cancer disease. The Cronbach alphas of the COPE scales were above 0.7 except the scale coping by suppression of competing activities.

### Svebak Humor Questionnaire

The L scale of Svebak Humor Questionnaire was employed [31]. The scale consists of sum scores of seven questions answered according to a 4-point Likert format. The L scale asks about the habitual tendency to enjoy or dislike comical situations.

### Education level

The level of education was also determined at the interview. The highest formal education was noted and scored according to how many years of education required at least to reach the noted level of education starting at seven years of age (Table I).

### Statistics

The statistical program package SPSS was employed (Ver. 17.0; SPSS Inc. Chicago, IL, USA). The Pearson's  $r$ , partial correlation analysis, reliability analysis

Table II. TNM stage of the included patients.

		N stage				Total
		0	1	2	3	
T stage	is	2	0	4	0	6
	1	55	3	6	2	66
	2	28	3	8	0	39
	3	7	4	4	0	15
	4	6	3	4	0	13
Total		98	13	26	2	139

and regression analyses were performed as indicated. Statistical significance was considered if  $p < 0.05$ . If  $r$  values reach 0.4 they were considered to be strong, and were marked in bold. Furthermore,  $r$  squared is common variance (CV).

## Results

### QoL scores association to GHQ scores

GHQ Likert and case scores were closely associated as measured by correlation coefficients ( $r = 0.81$ ;  $p < 0.000$ ). The QoL sum scores correlation to the GHQ scores ranged between  $r = 0.45$  and  $r = 0.62$  (all  $p < 0.001$ ) corresponding with 20–38% common variance (CV) (Table III).

### QoL/GHQ score associations with smoking and alcohol consumption levels

Table III shows the correlations between the alcohol consumption level histories, the QoL sum scores and GHQ scores of the included HNSCC patients. The correlations ranged between 0.17 and 0.31 (CV: 2.9–9.6%) indicating an inverse relation between alcohol consumption history and GHQ/QoL. Number of years smoked correlated only with general symptom QoL scores (CV=2.9%;  $p < 0.05$ ). Present level of smoking, was inversely associated with QoL/GHQ scores with maximum CV at 7.8%.

### QoL/GHQ scores dependent on TNM stage, HNSCC treatment level and time since treatment

The numerical T stage predicted QoL level, i.e. with the C30 functional sum score ( $r = -0.24$ ,  $p < 0.01$ ), the

C30 symptom sum score ( $r = 0.21$ ,  $p < 0.05$ ), the H&N35 sum score ( $r = 0.37$ ,  $p < 0.001$ ), but not the GHQ score (Table IV). The N-stage predicted the GHQ scores ( $r = 0.17$ ,  $p < 0.05$ ) and the H&N35 sum score ( $r = 0.24$ ,  $p < 0.01$ ). Whether performed neck dissection or given neck radiation therapy (RT), as well as RT dose, predicted GHQ scores with CV around 5% (Table IV). All treatment-derived scores, except whether local surgery was performed or not, predicted H&N35 scores with CV ranging around 15%. Time between HNSCC primary treatment and QoL/GHQ scores were not associated (results not shown).

### QoL/GHQ score associations with personality scores

All sum QoL scores correlated with the neuroticism scores, i.e. the QLQ-C30 functional sum score ( $r = -0.52$ ;  $p < 0.000$ ), the QLQ-C30 symptom score ( $r = 0.52$ ;  $p < 0.000$ ), and the QLQ-H&N35 sum score ( $r = 0.44$ ;  $p < 0.000$ ). The higher neuroticism scores, the lower QoL scores were determined. The GHQ scores also correlated closely with neuroticism ( $r = 0.51/59$ ;  $p < 0.000$ ) (Table III).

At the individual scale level, all C30 indexes but “diarrhea” correlated significantly with the neuroticism levels (Table V). With the H&N35 scores, all scores except “senses” and “coughing” correlated significantly with the neuroticism scores (Table V).

The lie score levels were mostly neither associated with the QoL levels nor GHQ levels (Table III).

### QoL/GHQ score associations with general COPE scores

A high level of avoidance coping (Coping by behavioral disengagement) was associated with lowered

Table III. General health questionnaire (GHQ) and EORTC C30/H&N35 QoL sum-scores versus Eysenck personality inventory (EPI) neuroticism, selected COPE scores, sense of humor, smoked years, cigarettes smoked per week and alcohol consumption level scored by included patients.

	GHQ		EORTC QLQ sum scores		
	Likert	case	C30 function	C30 symptom	H&N35
GHQ case/control	<b>.81***</b>				
C30 function sum	-.57***	-.62***			
C30 symptom sum	.52***	.56***	-.82***		
H&N35 sum	.45***	.45***	-.64***	.61***	
EPI Neuroticism	.59***	.51***	-.52***	.52***	.44***
EPI Lie	-.07	-.13	.21*	-.11	-.09
COPE suppression of competing activities	.43***	.31***	-.42***	.30***	.30***
COPE social support of emotional reasons	.05	.06	-.12	.13	.06
COPE behavioral disengagement	.51***	.54***	-.51***	.33***	.40***
COPE humor	-.01	.00	-.08	.06	.18*
Svebak humor questionnaire (L-scale)	.28***	.18*	-.20*	.21*	.30***
No. cigarettes smoked per week	.12	.13	-.24**	.28***	.22*
Years smoked	-.06	-.09	-.08	.17*	.11
Use of alcohol	.17	.21*	-.31***	.22**	.15

\* =  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

Table IV. Correlations between TNM stage, indicated given treatment and GHQ/sum QoL scores.

	GHQ Likert	EORTC QLQ sum scores		
		C30 functional	C30 symptom	H&N35
T stage	.16	-.24**	.21*	.37***
N stage	.17*	-.05	-.04	.24**
Local surgery (0/1)	-.03	.02	.07	-.09
Neck dissection (0/1)	.20*	-.20*	.16	.44***
Flap surgery (0/1)	.22*	-.18*	.17*	.24**
RT (0/1)	.16	-.13	.10	.41***
RT dose	.15	-.15	.12	.41***
RT primary tumor (0/1)	.15	-.13	.11	.39***
RT neck	.24**	-.15	.06	.47***

RT=radiation therapy.

\* =  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

QoL level, i.e. specifically the QLQ-C30 functional sum score ( $r = -0.51$ ;  $p < 0.001$ ), the QLQ-C30 symptom score ( $r = 0.33$ ;  $p < 0.001$ ), and the QLQ-H&N35 cluster sum score ( $r = 0.40$ ;  $p < 0.001$ ) (Table III). At the individual QoL index level, level of avoidance coping correlated with most of the QoL scores but direct symptom indexes like “dyspnoea” and “coughing” (Table V). The GHQ scores were also associated with avoidance coping ( $r = 0.51/54$ ;  $p < 0.001$ ).

“Coping by suppression of competing activity” was associated with the QoL scores, i.e. the QLQ-C30 functional sum score ( $r = -0.42$ ;  $p < 0.001$ ), the QLQ-C30 symptom score ( $r = 0.30$ ;  $p < 0.001$ ), and the QLQ-H&N35 sum score ( $r = 0.30$ ;  $p < 0.001$ ) (Table III). At the individual QoL index level, “coping by suppression of competing activities” correlated with most QoL indexes except those reflecting physical functioning (Table V). The GHQ scores were also correlated with coping by suppression of competing activities ( $r = 0.31/0.43$ ;  $p < 0.001$ ).

#### *Correlations between sense of humor, coping by humor and QoL/GHQ scores*

We have determined sense of humor by utilizing the Svebak Humor Questionnaire (SHQ) L-scale and asking about level of coping by humor (COPE scale). We have shown that the SHQ L-scale responses were inversely associated with QoL/GHQ levels with CV 3% and 9% (Table III).

#### *Importance of gender and age of the patients as related to relations between GHQ scores, QoL scores, neuroticism, the cope and sense of humor responses*

In addition, information about gender, age and educational level were included for partial correlation analyses as control variables correlating levels of COPE variables and QoL responses. No changed

association was determined between the choice of coping and QoL scores (analyses not shown).

#### *Correlations between neuroticism, the cope and sense of humor responses*

Neuroticism correlated to sense of humor with  $r = 0.20$  ( $p < 0.05$ ). The significant correlations determined between the neuroticism and the COPE scores were 0.17 (social support for emotional reasons) ( $p < 0.05$ ), 0.34 (suppression) ( $p < 0.000$ ) and 0.39 (behavioral disengagement) ( $p < 0.000$ ).

#### *Interrelation between GHQ/QoL scores, neuroticism, the cope and sense of humor responses as well as TNM stage*

We have furthermore studied the association between the QoL/GHQ scores, the psychological variables and the TNM stage (Table VI) as measured by stepwise regression analyses. We have determined the total common variances ranging from 40 to 48%. Most closely associated with GHQ/QoL scores was neuroticism (CV=5–17%), but coping by behavioral disengagement (CV=5–11.5%) and coping by suppression of competing activities (CV≈2%) were also associated. SHQ scores were also associated with around 2% common variance. The unique QoL prediction of the TNM stage ranged from 2% of the GHQ scores to 11.5% of the H&N35 sum score (Table VI). We have also depicted the associations into Figure 1. The thickness of the line indicates the relative importance of the association.

## **Discussion**

Quality of life (QoL) and distress ratings were studied in a cohort of survivors of HNSCC carcinoma in Western Norway with tumors primary diagnosed from 1992 to 2002 with a 96.5% response rate.

Table V. Individual EORTC C30/H&N35 QoL scores versus neuroticism, selected COPE scores and sense of humor scored by included patients.

EORTC QLQ index	EPI-N	COPE suppr	COPE ss emo	COPE beh dis	GHQ Likert	GHQ Case- control
<b>EORTC QLQ C30 scores</b>						
General health/QoL	-.51***	-.37***	-.04	-.38***	-.59***	-.51***
Physical functioning	-.24**	-.25**	.01	-.26**	-.28***	-.34***
Role functioning	-.37***	-.30***	-.03	-.29***	-.39***	-.44***
Emotional functioning	-.62***	-.40***	-.10	-.46***	-.60***	-.60***
Cognitive functioning	-.44***	-.21*	-.22**	-.36***	-.36***	-.46***
Social functioning	-.35***	-.37***	-.11	-.54***	-.48***	-.48***
Fatigue	.40***	.29***	.12	.32***	.43***	.46***
Nausea and vomiting	.39***	.34***	.06	.29***	.41***	.45***
Pain	.41***	.28***	.15	.34***	.34***	.40***
Dyspnoea	.22*	.12	-.01	.12	.22*	.27**
Insomnia	.47***	.21*	.09	.16	.40***	.36***
Appetite loss	.32***	.19*	.12	.18*	.38***	.40***
Constipation	.21*	.12	.08	-.08	.23*	.23*
Diarrhea	.15	.03	.09	.09	.20*	.21*
Financial difficulties	.34***	.17*	.03	.35***	.30***	.40***
<b>EORTC QLQ H&amp;N35 scores</b>						
Pain	.25**	.27**	.12	.42***	.36***	.45***
Swallowing	.18*	.25**	-.02	.22*	.35***	.33***
Senses	.10	.17*	.09	.08	-.02	-.01
Speech	.29***	.26**	.07	.33***	.32***	.28***
Social eating	.29***	.22*	-.03	.19*	.38***	.33***
Social contact	.35***	.28***	-.12	.48***	.50***	.49***
Sexuality	.35***	.17	-.00	.29***	.28**	.29***
Teeth	.25**	-.01	-.09	.26**	.26**	.30***
Open mouth	.18*	.14	-.04	.17*	.29***	.29***
Dry mouth	.29***	.21*	.11	.28***	.29***	.24**
Sticky saliva	.21*	.19*	.07	.20*	.19*	.12
Coughing	.14	-.03	.09	-.04	.02	.08
Feeling ill	.44***	.29***	.17	.33***	.41***	.45***

Psychosocial variables as named in Table II.

\* = p<0.05, \*\*p<0.01, \*\*\*p<0.001.

Personality, coping, QoL, and distress scores were based on questionnaires answered during structured interviews performed at least one year after completed therapy. The distress was measured by the GHQ inventory [11]. The EORTC QLQ inventory [24–27] was employed as the QoL measurement instrument, personality scores by the EPI [28] and choice of coping by the COPE questionnaire [30].

We have shown that the GHQ scores correlated closely with the EORTC QoL scores. This was more the case with general QoL scores than with the symptom specific QoL scores. The common variance ranged between 20% for H&N35 QLQ QoL indexes and 35% for the general C-30 QLQ QoL indexes.

The TN stage of the included patients predicted to some extent QoL and the GHQ scores of the

Table VI. Multiple stepwise regression analysis with GHQ-Likert/QoL-sum scores as dependent variable and neuroticism, COPE scores, Svebak humor questionnaire (SHQ) (L-scale) and TNM stage as independent variables.

	GHQ .48			C30 Function sum .425			H&N35 sum .40		
	β*	t	p	β	t	p	β	t	p
Adjusted r <sup>2</sup> total									
EPI Neuroticism	.41	5.9	.000	-.40	-5.6	.000	.24	4.2	.000
COPE beh. Dis.	.25	3.4	.001	-.34	-4.8	.000	.22	3.0	.004
SHQ (L scale)	.14	2.2	.027				.16	2.3	.024
COPE suppr.	.15	2.2	.034						
T stage				-.20	-3.0	.003	.29	4.3	.000
N stage	.14	2.1	.042				.18	2.7	.008

Psychosocial variables as named in Table II.

\* = standardized.

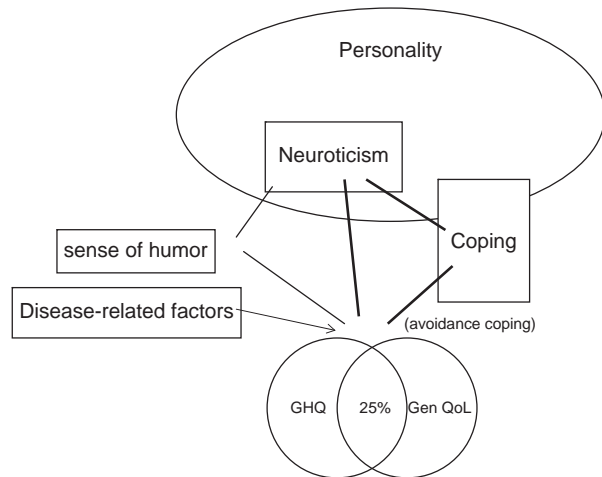


Figure 1. Model depicting the associations between the investigated variables. Thicknesses of lines indicate strength of association.

patients. Furthermore, the more treatment given, the more decreased the H&N35 scores obtained. These results are in line with previous findings [18], and further broadens the concept that specific symptoms, but less general QoL is associated with extent of tumor treatment of HNSCC patients. Furthermore, time between treatment and QoL/distress measurement were not associated as expected [18].

We [32] and others [33] have previously reported that levels of alcohol consumption, as well as smoking levels, are associated with QoL. This has also been determined presently. In addition, the GHQ scores were presently associated with alcohol consumption level, but not with smoking level.

This paper report relatively strong associations between presence of the personality trait neuroticism and low both QoL and GHQ scores. Thus, the association between neuroticism and both QoL and distress are additionally confirmed [18,19]. There was basically no significant association between the QoL/GHQ scores and the Eysenck lie responses. We have, however, not studied all proposed personality trait, like i.e. optimism which has been shown to be associated with QoL in HNSCC patients [34]. It is likely that these traits also explain some of the QoL and GHQ variance.

We and others [18,35] have previously shown that present avoidance coping is associated with lowered QoL. This has presently been confirmed. We have presently shown the same to be the case with the GHQ scores. On the other hand, we did not determine any general relation between emotional coping measured by coping by social support of emotional reasons and QoL/GHQ scores. Coping by suppression of competing activities were broadly inversely associated with the QoL and GHQ scores. This is especially interesting as coping by suppression of

competing activities are problem-focused coping, but presently does not represent adequate coping in HNSCC patients when coping with their disease. As pointed out previously, problem-focused coping may not always be adequate coping [36].

We have in the present sample determined the correlations between sense of humor on the one side and distress and quality of life on the other side. We have determined that sense of humor, but not coping by humor is related to distress and quality of life as reported previously concerning QoL [1].

Demographic factors may also explain the association between neuroticism/COPE responses and the QoL/GHQ responses. When gender, age and level of education of the patients were included to the analyses, we did not observe any changed relation pattern between the investigated variables.

Regression analyses were also performed with age, TNM stage, neuroticism scores, COPE and sense of humor responses included as independent variables. The GHQ or QoL sum scores were included as dependent variables. It should when interpreting these analyses be born in mind that personality and coping to some extent represent different cognitive levels. In the present case, it can e.g. be said that the personality trait neuroticism works through coping. Based on the regression analyses we have estimated that between 30% and 50% of the distress and QoL variances were explained by the psychological factors. One half was a direct relation between neuroticism and QoL, one third was directly between choice of coping and distress and one third was from neuroticism via coping to distress. In addition, the TNM stage predicted the QoL/GHQ scores with a CV ranging between 3% and 11%.

In the present sample, we have shown a remarkable coherence between the QoL and distress scores. This indicates that distress may also be viewed as a QoL variable as seems to be the case with the relation between mood and QoL [37]. Thus, the present study adds insight how to interpret distress and mood scores outside the scores indicating disease. This should be further examined.

The present investigation shows that if the aim of treatment is to generally improve QoL and reduce distress of the HNSCC patients, psycho-therapy may be indicated as an integral part of HNSCC treatment [38]. The present study points to that emphasis should be put on limiting avoidance coping, and to encourage coping by acceptance and positive reinterpretation, and not simply encourage all problem-focused coping as is often done [38]. This may add to the basis of treatment options with the goal to help the patients to cope adequate. It would be of interest to study if an intervention study based on the present findings could show improved mood, QoL

and distress among patients suffering from HNSCC. The present findings call for studies where psychological treatment of patients is given within an experimental design in order to study if improved QoL is possible.

## Conclusion

Among successfully treated HNSCC patients, distress and QoL indexes were scored with a common variance between 20% and 35%. A high T stage or treatment level predicts low symptom QoL, but not level of distress. High neuroticism, present avoidance coping and coping by suppression of competing activity were generally associated with low QoL and high distress. The measured psychological factors accounted for about one third of the measured variance of the QoL and GHQ responses while the treatment related factors account for about 10%, especially for the H&N indexes. Distress scores may possibly be regarded as QoL variables.

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