

# The influence of resilience on self-care and quality of life in COPD patients: a cross-sectional study

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## Abstract

**Background:** Due to symptoms like shortness of breath, coughing and fatigue, chronic obstructive pulmonary disease (COPD) patients often experience a reduced quality of life (QOL). COPD patients need daily self-care behavior to prevent, control and manage the consequences of the disease. The degree of self-care and QOL can be disrupted due to stressful live events which can be addressed by building resilience. To strengthen the nursing care and further develop nurses' knowledge, more evidence is needed about the relationship between resilience, QOL and self-care in COPD patients.

**Aim:** The aim was to investigate the influence of resilience on self-care and QOL in COPD patients.

**Method:** A cross sectional design was performed in a pulmonary medicine outpatient clinic in a Dutch hospital among COPD patients. Self-care was measured with self-care of chronic illness inventory, QOL was measured with the clinical COPD questionnaire and resilience was measured with resilience evaluation scale. Possible confounders included were gender, age, smoking, years diagnosed with COPD, educational level, social support and pulmonary function. Multiple regression was performed between the determinant, confounders and both outcomes.

**Results:** In analysis, 125 participants were included. The results show that resilience ( $\beta=0.51$ ,  $P<0.001$ ) had an association with self-care confidence when corrected for possible confounders. The variance in self-care confidence explained by resilience is 22%. In addition, there was also an association between resilience ( $\beta=-0.46$ ,  $P<0.001$ ) and QOL when corrected for possible confounders. The variance in QOL explained by resilience is 25%.

**Conclusion:** Results of current study indicate that resilience have an association with self-care confidence and QOL in COPD patients. This means that the higher the resilience the better the self-care confidence and the QOL. This knowledge contributes to strengthen the nursing care and further develop nurses' knowledge. In the future, this could mean treatment is aimed at increasing resilience.

*Keywords: COPD, Resilience, Self-care and Quality of life.*

## Samenvatting

**Achtergrond:** Patiënten met een Chronische Obstructieve Longziekte (COPD) ervaren vaak een verminderde kwaliteit van leven (QOL) door symptomen als kortademigheid, hoesten en vermoeidheid. Om de gevolgen van de ziekte te voorkomen hebben COPD patiënten zelfzorg gedrag nodig. De mate van zelfzorg en QOL kan worden verstoord door stressvolle levensgebeurtenissen wat kan worden aangepakt door het opbouwen van veerkracht. Om de verpleegkundige zorg te versterken en kennis van verpleegkundigen verder te ontwikkelen, is er meer bewijs nodig over de relaties tussen veerkracht, zelfzorg en QOL bij COPD patiënten.

**Doel:** Het doel was om de invloed van veerkracht op zelfzorg en QOL te onderzoeken in COPD patiënten.

**Methode:** Een cross sectioneel design werd uitgevoerd op een polikliniek longgeneeskunde in een Nederlands ziekenhuis. Zelfzorg werd gemeten met de self-care of chronic illness inventory, QOL met de clinical COPD questionnaire en veerkracht met de resilience evaluation scale. Geslacht, leeftijd, rookstatus, aantal jaren diagnose COPD, opleidingsniveau, sociale ondersteuning en longfunctie werden toegevoegd als mogelijke confounders. Tussen de determinant, confounders en uitkomsten werd een meervoudige regressie analyse uitgevoerd.

**Resultaten:** In de analyse werden 125 deelnemers geïnccludeerd. Hieruit bleek dat veerkracht ( $\beta=0.51$ ,  $P<0.001$ ) een associatie had met zelfzorg vertrouwen. De variantie in zelfzorg vertrouwen verklaard door veerkracht is 22%. Daarnaast was er een associatie tussen veerkracht ( $\beta=-0.46$ ,  $P<0.001$ ) en QOL. De variantie in QOL verklaard door veerkracht is 25%. De confouders waren niet van invloed op de uitkomsten.

**Conclusie:** De resultaten geven aan dat veerkracht een associatie heeft met zelfzorg vertrouwen en met QOL. Dit betekent hoe hoger de veerkracht, hoe beter de zelfzorg en QOL is in COPD patiënten. Deze kennis draagt bij aan het versterken van de verpleegkundige zorg en het ontwikkelen van de kennis van verpleegkundigen. Dit betekent dat in de toekomst de behandeling zich zou kunnen richten op het verbeteren van veerkracht.

*Trefwoorden: COPD, veerkracht, zelfzorg en kwaliteit van leven.*

## Introduction

Chronic obstructive pulmonary disease (COPD) is a disease that is characterised by a persistent and progressive airflow limitation, hyperinflation, mucus hypersecretion, abnormal gas exchange associated with frequent exacerbations and comorbidities<sup>1,2</sup>. An exacerbation of COPD means that the symptoms rapidly deteriorate<sup>3</sup>. Worldwide, 11% of people older than thirty years suffers from COPD. The proportion of COPD patients is increasing due to risk factors such as smoking and ageing of the population<sup>4,5</sup>. Treatment objectives focus on relieving and reducing the impact of symptoms, improving participation in daily activities, improving the quality of life (QOL) and reducing adverse events in the future, such as exacerbations<sup>1,6</sup>.

Due to symptoms like shortness of breath, coughing, sputum production and fatigue<sup>4</sup>, COPD patients often experience a reduced QOL<sup>1,7,8</sup>. There are many definitions of QOL worldwide<sup>9-11</sup>. A widely used definition is: 'quality of life are factors that make patients satisfied with their lives'<sup>9</sup>. These factors consist of social well-being, activity levels, health, social support, mental and emotional health, life acceptance and satisfaction with life situations<sup>9</sup>.

COPD patients need daily self-care behaviour to prevent, control and manage the physical, emotional and social consequences of the disease<sup>4</sup>. Self-care behaviours of patients with COPD change over time, since the disease is progressing and the burden is increasing<sup>4</sup>. The degree of knowledge and social support contribute to the change of self-care behaviour<sup>4</sup>. Meaning that patients continuously adapt their self-care behaviour to new circumstances they are confronted with<sup>4</sup>. According to the middle-range theory<sup>12</sup>, COPD patients self-care encompasses three dimensions: maintenance, monitoring and management<sup>12</sup>. Self-care maintenance is the behavior that patients use to maintain physical and emotional stability<sup>12</sup>. Self-care monitoring is a process of observing changes in symptoms<sup>12</sup>. Self-care management is the patients response when symptoms are present<sup>12</sup>. In addition, there is also self-care confidence which is someone's ability to engage in self-care maintenance and management behaviours<sup>13,14</sup>.

The degree of self-care and QOL can be disrupted in COPD patients due to stressful life events<sup>1,15</sup> such as losing a job<sup>15</sup>, breathing difficulties and decrease in daily activities<sup>16</sup>. There is evidence that stressful life events can be addressed by building resilience<sup>1,15</sup>. In patients with other chronic diseases (such as rheumatoid arthritis and diabetes mellitus) evidence shows that resilience is a good predictor for improving QOL and self-care<sup>17,18</sup>. Resilience is the ability to adapt, recover and come back from setbacks and difficult experiences<sup>3,15</sup>. Therefore resilience is the process of making a good adjustment when a life event interferes with the ability to provide self-care<sup>15</sup>. Twenty years ago resilience was something a patient has or has not, but now it is seen as a quality that can be developed<sup>3</sup>.

Resilience depends on inner strengths and protective factors such as self-awareness, self-response, cognitive and social skills, optimism and a sense of humor<sup>15</sup>.

Currently there is evidence concerning resilience factors are essential for improving the QOL in COPD patients<sup>1</sup>, such as self-response, optimism and relationships<sup>1,15</sup>. There is also evidence about understanding effective self-care in COPD patients<sup>2,4</sup>. Self-care in COPD patients encompasses three dimensions: maintenance, monitoring and management<sup>2</sup>. In other chronic diseases resilience seems a good predictor for improving QOL and self-care<sup>17,18</sup>. To strengthen the nursing care and further develop nurses' knowledge, more evidence is needed about the relationship between resilience, QOL and self-care in COPD patients. Therefore, the aim of this study is to investigate the influence of resilience on self-care and QOL in COPD patients. The hypothesis in this study is that COPD patients with good resilience have a higher degree of self-care and a better QOL.

## Method

### Study design and sample

Resilience, self-care and QOL can fluctuate in time<sup>1,4,8</sup>. The aim is to measure the influence of resilience on self-care and QOL and not how this vary over time. So therefore this study has a quantitative, cross-sectional design. The determinant (resilience) and outcomes (self-care and QOL) were measured simultaneously using questionnaires<sup>19</sup>. The study population consisted of adult COPD patients treated at a pulmonary medicine outpatient clinic in a Dutch general hospital. To be eligible to participate the participants had being able to read Dutch and being physically and cognitively able to complete a questionnaire. Participants were excluded when they were in the terminal phase of their illness. To achieve a lower risk of selection bias a consecutive sample was used<sup>20</sup>.

For regression analysis, the rule of thumb is that for each parameter at least ten participants must be included<sup>21</sup>. In this study three determinants (resilience, self-care and QOL) and seven predictors (gender, age, smoking, years diagnosed with COPD, educational level, social support and pulmonary function) have been included in the analysis. The needed sample size was therefore  $10 \times 10 = 100$  participants.

### Procedure

After permission, the researcher had access to the overviews of the consultation hours of six pulmonologists and looked for eligible COPD patients. Eligible COPD patients were called by the researcher to explain the study. After willingness to participate the information letter, informed consent form and questionnaire were sent using research electronic data capture (REDCap). COPD patients who indicated that they could not use computers well received the information letter, the informed consent form, the questionnaire and a stamped

addressed envelope by post. If the patient had not completed the questionnaire after two weeks they received a reminder by telephone or an automatic reminder by REDCap. The data collection took place between February and May 2021.

## **Data collection**

### Outcomes

#### *Self-care*

Self-care was measured using the self-care of chronic illness inventory (SC-CII). The SC-CII is a questionnaire with eight questions about maintenance, six questions about monitoring, six questions about management and ten questions about confidence that were measured on different Likert scales<sup>22</sup>. Higher scores indicates better self-care<sup>22</sup>. The SC-CII is a reliable and valid instrument to measure self-care in patients with a chronic disease<sup>22</sup>. A validated Dutch version of the SC-CII was used<sup>23</sup>.

#### *Quality of life*

The quality of life was measured with the clinical COPD questionnaire (CCQ). The CCQ is a questionnaire with ten questions that were measured on a 7 point Likert scale<sup>24</sup>. The score was calculated by adding all the scores together and dividing this by 10<sup>24</sup>. Lower scores indicate higher quality of life in COPD patients<sup>24</sup>. There is strong evidence for good reliability, validity and responsiveness of the CCQ<sup>24,25</sup>. The CCQ is translated and validated in Dutch<sup>26</sup>.

### Determinant

#### *Resilience*

Resilience was measured with the resilience evaluation scale (RES), which contains nine questions that were measured on a 5 points Likert scale (0: totally disagree to 4: totally agree)<sup>27</sup>. The total score was the sum of the scores of the questions<sup>27</sup>. Higher scores indicate a greater degree of resilience<sup>27</sup>. The RES is a valid and reliable instrument for measuring resilience<sup>27</sup>. A validated Dutch version of the RES was used<sup>27</sup>.

#### Demographic data

The collected demographics were age<sup>28,29</sup>, gender<sup>30,31</sup>, smoking status<sup>32</sup>, years diagnosed with COPD<sup>29</sup>, educational level<sup>29,31</sup> and severity of COPD<sup>33</sup>. The received social support<sup>34</sup> was also collected. These parameters were included because they were expected by literature to have an influence on resilience, self-care or QOL in COPD patients. All parameters were added to the questionnaire except severity of COPD which was taken from the electronic patient file. All questionnaires and individual questions were combined so that the patient received one questionnaire.

### *Social support*

The social support list – interaction (SSL12-I) contains four questions per category: everyday support, support with problems and appreciation on a four point Likert scale (1: rarely or never to 4: very often) and measures the received social support<sup>35</sup>. The higher the score, the more social support a patient experience<sup>36</sup>. The SSL12-I has good reliability, validity and internal consistency<sup>35,37</sup>. A validated Dutch version of the SSL12-I was used<sup>35</sup>.

### *Severity of COPD*

The severity of COPD was measured using spirometry results. During the spirometry, the total exhaled air in the first second of exhalation (FEV1) and the total air from the total lung volume that can be exhaled in one breath (FVC) were measured<sup>38,39</sup>. The FEV1/FVC must be <0,70 to determine the classifications<sup>39</sup>. Mild (COPD1) is when the FEV1 is greater than 80%, moderate (COPD2) is when the FEV1 is between 50% and 80%, severe (COPD3) is when the FEV1 is between 30% and 50% and very severe (COPD4) is when the FEV1 is below 30%<sup>39</sup>.

### **Data analysis**

To analyse the data IBM SPSS statistics (IBM Corporation, Armonk New York) version 26.0 was used. Descriptive statistics (frequencies, mean, standard deviation and range) were used to represent the demographic data and the main parameters. Missing data were imputed in line with the instructions from the questionnaires<sup>27,37,40,41</sup>. Data were checked by histograms and quantile-quantile plots to see if the data was normally distributed. A scatterplot and Spearman correlation matrix were made to look for correlations, outliers and for the direction and strength of the relationships<sup>42</sup>. Categorical variables were coded into dummy variables for use in the multiple regression<sup>20</sup>. In order to determine the relation between resilience and self-care and resilience and QOL hierarchical multiple regression were performed to see if the independent variables influence the dependent variables. A two tailed test with an alpha of 5% is used because it was not clear whether it was a negative or a positive relationship<sup>42</sup>. Hierarchical multiple regression was chosen because the researchers can determine the order of entry of the determinants based on theoretical considerations<sup>20</sup>.

Regression analysis was performed for each outcome (QOL and self-care). For self-care, four regression analyses were performed because the four components (maintenance, monitoring, management and confidence) could not be added together<sup>41</sup>. Outcomes were corrected for possible confounders by entering the determinants in three blocks based on theoretical considerations<sup>20</sup>. The first block consisted of resilience and the outcome. Gender,

age and educational level were added in the second block. In the third block, smoking, pulmonary function, social support and years diagnosed with COPD were added. The regression models analysed how much of the variance could be explained by the different blocks. Also, the influence of the beta coefficients in the models were examined. Regression analysis was performed five times. The Bonferroni correction was used to reduce the chance of coincidentally finding significant results<sup>20</sup>. Therefore, the results were perceived significant when the p-value was below 0,01<sup>42</sup>.

### **Ethical considerations**

This research is no subject to the WMO and this is tested by the MEC-U committee of the Santeon organisation. Also, approval is obtained from the participating organisation to conduct the research. All participants have given informed consent.

## **Results**

### **Study sample**

In total, 296 participants were approached for this study and 134 participants completed the questionnaire. In the analysis nine participants were excluded because the participants did not meet the criteria for COPD patient ( $FEV/FVC > 0.7$ ). Nine participants had missing values and these missing values could be imputed in the analysis. Three participants had not fill in their educational level and one participant had too many missing values in the SSLI-12, so these values were not imputed.

The mean age of the participants was 68.3 (SD 9.0) and 52% was male. The majority of the participants had a low educational level (52.8%), 32 participants had intermediate educational level and 24 participants had high educational level. Most participants were former smokers (82,4%) and the mean years diagnosed with COPD was 11.9 (SD 10.5). Most participants had COPD gold 2 (48.8%) or COPD gold 3 (35.2%). All the baseline characteristics were displayed in table 1.

### *Insert Table 1*

The mean, standard deviation, range and reference range of SSL12-I, RES, SC-CII and CCQ were displayed in table 2. The study participants scored received social support on intermediate level (mean 28.2, SD 6.1) measured with SSL12-I. On resilience the study participants scored fairly good (mean 22.5, SD 6.7) measured with the RES. The means of SC-CII were for maintenance 65.9 (SD 12.8), for monitoring 70.9 (SD 18.8), for management 59.9 (SD 17.7) and for confidence 71.5 (SD 18.8). Which means that self-care scored

reasonable good in the study participants. On QOL, the participants scored mediocre (mean 2.6, (SD 1.1) measured with the CCQ.

*Insert Table 2*

## **Multiple regression**

### *Self-care*

Tables 4.1 to 4.4 shows that each time resilience had been added in models 1. In models 2, resilience was added and corrected for possible confounders gender, age and educational level. Model 3 added resilience and corrected for possible confounders gender, age, educational level, smoking status, pulmonary function, social support and years diagnosed with COPD. Tables 4.1 to 4.4 shows that resilience was only associated with self-care confidence and not with the other components of self-care (maintenance, monitoring and management). After corrected for possible confounders in model 3, the association between resilience ( $\beta = 0.51$ ) and self-care confidence was still present. The variance in self-care confidence explained by resilience is 22%. So the higher the resilience score, the better self-care confidence was scored by COPD patients.

### *QOL*

Table 4.5 shows that in model 1 resilience ( $\beta = -0.50$ ) is associated with QOL. In model 2 and 3 adjustments are made for possible confounders gender, age, educational level, smoking status, pulmonary function, social support and years diagnosed with COPD. After corrected for possible confounders in model 2 and 3 the association between resilience and QOL was still present. The variance in QOL explained by resilience is 25%. So the higher the resilience score, the better QOL was scored by COPD patients.

*Insert Tables 4.1 to 4.5*

## **Discussion**

The current study aims to investigate the influence of resilience on self-care and QOL in COPD patients. The results indicate that associations exists between resilience and self-care confidence and between resilience and QOL. This association persists when correcting for possible confounders. So when resilience scored higher, there is more self-care confidence and better QOL in COPD patients.

The results of the current study on the association between resilience and self-care in COPD patients were not found in prior studies. In other patient groups this has been studied. In patients with heart failure an association was found between resilience and self-care

confidence and self-care maintenance<sup>43</sup>. These results of the study with heart failure patients were partly consistent with the results of current study. In addition, there is a number of studies that have not found comparable results with this study<sup>17,44,45</sup>. In patients with a drainage enterostomy a significant positive correlation between resilience and self-care was found<sup>17</sup>. In the study of patients with a drainage enterostomy self-care was measured with different components, namely general, developmental, specific care and did not measure self-care confidence<sup>17</sup>. This makes it difficult to compare these results with our study. In African-American men with diabetes an association was found between resilience and self-management<sup>44</sup>. The association between resilience and self-management was also found in older adults in the United States<sup>45</sup>. A possible explanation for the results not being in accordance with this study on COPD patients is that resilience and self-care have been measured with other measurement tools. In addition, it could also be that COPD patients had different levels of resilience or self-care than other patients groups.

The results of the current study between resilience and QOL in COPD patients are in accordance with the article by Cannon et al.<sup>1</sup>. Besides, there are also studies with other patient groups (gynaecological cancer, patient with drainage enterostomy) that support the association between resilience and QOL which was found in our study<sup>17,18,46</sup>. In the study with patients with a drainage enterostomy, it is described that a greater degree of social support leads to a greater resilience and thus a higher QOL<sup>18</sup>. In the current study, social support is not significant in the multiple regression analysis with outcome QOL. This means that social support is not a confounder for resilience and QOL in current study. An association between resilience and QOL has been found several times and in different patient groups, which reinforces the results of the current study.

In order to appreciate the findings some strengths and limitations must be considered. A strength of our study is the generalisability of the results. The sample of current study is a reasonable representation of the population. There are about the same number of men and women in the Netherlands with COPD in the age of 65-69<sup>47</sup>. In addition, more low educated people have COPD than highly educated people in the Netherlands<sup>47,48</sup>. This is reflected in the study sample. The GOLD status in the sample differs slightly from the population because GOLD 1 and 2 are the most common in the population<sup>49</sup> while in the sample gold 2 and 3 are most common. This may be because, the COPD patients treated in an outpatient clinic in a hospital have probably a higher gold stadia of the disease. In general, the sample is reasonably representative of the population and therefore the results can be generalised to other COPD patients who were treated in an outpatient clinic in a hospital. The used consecutive sample has strengthened the study since this ensures a lower risk of selection bias<sup>20</sup>. Also in this study only validated questionnaires were used. Another strength is that to

our knowledge, this is the first study that investigate the association between resilience and self-care in COPD patients.

A limitation is that the GOLD stages have been included to determine the severity of the disease, but a higher GOLD stage does not mean that COPD patients experiences more symptoms<sup>50</sup>. The ABCD classifications were currently used to indicate the severity of COPD<sup>50</sup>. It is therefore important to include the confounder GOLD status with caution in the results. A second limitation is the data of the spirometry was not always recent data and therefore not completely accurate for the GOLD classifications. In the current study smoking status was not a confounder in the analysis. A possible explanation could be that the sample was too homogeneous for smoking status, namely 82,4% were former smokers. Another limitation is that the current study was conducted during the COVID-19 pandemic. The lives of COPD patients were not the same before the pandemic. In the literature, the experience of COPD patients during the pandemic were investigated and it shows that the pandemic had a low impact on COPD patients<sup>51</sup>. The results of that paper indicates that QOL scores were the same before the pandemic<sup>51</sup>. No research has been made on resilience and self-care scores in COPD patients before and after the COVID-19 pandemic as far as known.

The results of current study contribute to strengthen the nursing care and the development of nurses' knowledge. The results can be used to develop an intervention to improve self-care confidence and QOL in COPD patients. To be able to develop an intervention, the medical research council framework can be used<sup>52</sup>. Future research should focus on intervention development and feasibility testing. In stroke patients an intervention is under development to improve resilience after a stroke<sup>53</sup>. It is important to develop and evaluate an intervention in COPD patients. In the future, an intervention focusing on resilience could lead to improvements in QOL and self-care confidence in COPD patients. Another next step could be to conduct a longitudinal study to determine causal relationships between resilience and self-care and between resilience and QOL. When other studies were performed, other confounders can be investigated such as diagnoses of anxiety, depression, marital status, comorbidity and severity of the complaints. These confounders were not included in the current study because not enough participants could be included to measure all the possible confounders. It would also be an addition to conduct a mixed method study so more meaning can be given to the results and to discover other relationships<sup>54</sup>. A number of patients preferred to have an option to give oral explanations about the association between resilience, self-care and QOL.

In conclusion, the results of current study show that resilience is associated with self-care confidence and QOL in COPD patients. This means that patients with higher resilience have more self-care confidence and better QOL. This knowledge contributes to strengthen the nursing care and further develop nurses' knowledge.

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## Tables

**Table 1**  
**Baseline characteristics**

Variables	Total Population (N=125)
Gender	
- Male	65 (52.0%)
- Female	60 (48.0%)
Age, years (mean $\pm$ SD)	68.3 $\pm$ 9.0
Smoking	
- Current	21 (16.8%)
- Former	103 (82.4%)
- Never	1 (0.8%)
Years diagnosed with COPD (mean $\pm$ SD)	11.9 $\pm$ 10.5
Educational level <sup>a</sup>	
- Low	66 (52.8%)
- Intermediate	32 (25.6%)
- High	24 (19.2%)
Pulmonary function <sup>b</sup>	
- GOLD 1 (mild)	10 (8.0%)
- GOLD 2 (moderate)	61 (48.8%)
- GOLD 3 (severe)	44 (35.2%)
- GOLD 4 (very severe)	9 (7.2%)

a: Low EL is primary education and lower secondary school<sup>55</sup>. Intermediate EL is secondary school and secondary vocational education<sup>55</sup>. High EL is higher professional and scientific education<sup>55</sup>. Three participants did not fill in their educational level.

b: Mild(COPD1) is when the FEV1 is greater than 80%, moderate(COPD2) is when the FEV1 is between 50% and 80%, severe(COPD3) is when the FEV1 is between 30% and 50% and very severe(COPD4) is when the FEV1 is below 30%<sup>39</sup>.

**Table 2**

***Means, standard deviations and range of questionnaires social support list – interaction (SSL12-I). resilience evaluation scale (RES). Self-care of chronic illness inventory (SC-CII) and clinical COPD questionnaire (CCQ).***

<b>Questionnaires</b>	<b>Mean</b>	<b>SD</b>	<b>Range</b>	<b>Ref range</b>
SSL12-I	28.2	6.1	13.0 - 48.0	12 - 48
RES	22.5	6.7	0.0 - 36.0	0 - 36
SC-CII maintenance	65.9	12.8	37.5 - 96.9	0 - 100
SC-CII monitoring	70.9	18.8	8.0 - 100.0	0 - 100
SC-CII management	59.9	17.7	8.0 - 96.0	0 - 100
SC-CII confidence	71.5	18.8	17.5 - 100.0	0 - 100
CCQ	2.6	1.1	0.2 - 5.9	0 - 6

Note: The different components of the self-care questionnaire are shown separately because it is not the intention that the parts are added together<sup>41</sup>.

**Table 4.1**

**Multiple regression outcome SC-CII maintenance**

	Model 1			Model 2 (block 1 and 2)			Model 3 (block 1.2 and 3)		
	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI
<b>block 1</b>	-0.003								
RES		0.07	(-0.12; 0.27)		0.06	(-0.13; 0.25)		0.06	(-0.13; 0.26)
<b>block 2</b>				-0.007					
Gender					-0.001	(-0.19; 0.19)		-0.01	(-0.20; 0.18)
Age					0.09	(-0.10; 0.28)		0.06	(-0.14; 0.25)
Educational level - intermediate vs low					0.13	(-0.06; 0.32)		0.13	(-0.07; 0.32)
educational level - high vs low					0.17	(-0.02; 0.36)		0.17	(-0.02; 0.36)
<b>block 3</b>							0.042		
Smoking - Former vs current								0.19	(-0.003; 0.39)
Smoking - Never vs current								0.13	(-0.07; 0.32)
pulmonary function - gold 2 vs gold 1								-0.25	(-0.60; 0.11)
pulmonary function - gold 3 vs gold 1								-0.20	(-0.55; 0.15)
pulmonary function - gold 4 vs gold 1								-0.11	(-0.36; 0.14)
SSL12-I								0.12	(-0.07; 0.31)
Years diagnosed with COPD								0.07	(-0.12; 0.26)

Note: SSL12 – I: social support list – interaction, RES: resilience evaluation scale, CCQ: clinical COPD questionnaire

R<sup>2</sup>: adjusted r square

\* P ≤ 0,01 \*\* P ≤ 0,001

**Table 4.2**

**Multiple regression outcome SC-CII management**

	Model 1			Model 2 (block 1 and 2)			Model 3 (block 1.2 and 3)		
	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI
<b>block 1</b>	-0.008								
RES		0.02	(-0.17; 0.21)		0.04	(-0.14; 0.23)		0.06	(-0.13; 0.25)
<b>block 2</b>				0.033					
Gender					-0.11	(-0.30; 0.07)		-0.11	(-0.29; 0.08)
Age					0.13	(-0.06; 0.32)		0.15	(-0.04; 0.34)
Educational level - intermediate vs low					0.03	(-0.16; 0.21)		-0.02	(-0.20; 0.17)
educational level - high vs low					-0.23	(-0.41; -0.04)		-0.22	(-0.40; -0.03)
<b>block 3</b>							0.078		
Smoking - Former vs current								0.001	(-0.19; 0.19)
Smoking - Never vs current								0.20	(0.01; 0.38)
pulmonary function - gold 2 vs gold 1								-0.06	(-0.41; 0.29)
pulmonary function - gold 3 vs gold 1								0.06	(-0.29; 0.39)
pulmonary function - gold 4 vs gold 1								0.04	(-0.20; 0.28)
SSL12-I								0.25*	(0.06; 0.43)
Years diagnosed with COPD								0.04	(-0.15; 0.22)

Note: SSL12 – I: social support list – interaction, RES: resilience evaluation scale, CCQ: clinical COPD questionnaire

R<sup>2</sup>: adjusted r square

\* P ≤ 0,01 \*\* P ≤ 0,001

**Table 4.3**

**Multiple regression outcome SC-CII monitoring**

	Model 1			Model 2 (block 1 and 2)			Model 3 (block 1.2 and 3)		
	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI
<b>block 1</b>	-0.008								
RES		0.02	(-0.17; 0.20)		0.03	(-0.16; 0.22)		0.07	(-0.12; 0.27)
<b>block 2</b>				0.004					
Gender					-0.13	(-0.31; 0.06)		-0.10	(-0.28; 0.10)
Age					0.14	(-0.05; 0.33)		0.14	(-0.05; 0.33)
Educational level - intermediate vs low					0.04	(-0.15; 0.22)		0.03	(-0.16; 0.22)
educational level - high vs low					-0.08	(-0.26; 0.11)		-0.06	(-0.25; 0.13)
<b>block 3</b>							0.021		
Smoking - Former vs current								0.07	(-0.13; 0.26)
Smoking - Never vs current								0.04	(-0.16; 0.22)
pulmonary function - gold 2 vs gold 1								-0.18	(-0.53; 0.17)
pulmonary function - gold 3 vs gold 1								-0.002	(-0.35; 0.35)
pulmonary function - gold 4 vs gold 1								0.01	(-0.24; 0.25)
SSL12-I								0.11	(-0.08; 0.30)
Years diagnosed with COPD								0.15	(-0.05; 0.33)

Note: SSL12 – I: social support list – interaction, RES: resilience evaluation scale, CCQ: clinical COPD questionnaire

R<sup>2</sup>: adjusted r square

\* P ≤ 0,01 \*\* P ≤ 0,001

**Table 4.4**

**Multiple regression outcome SC-CII confidence**

	Model 1			Model 2 (block 1 and 2)			Model 3 (block 1.2 and 3)		
	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI
<b>block 1</b>	0.221								
RES		0.48**	(0.33; 0.67)		0.48**	(0.34; 0.67)		0.51**	(0.37; 0.71)
<b>block 2</b>				0.222					
Gender					-0.06	(-0.22; 0.10)		-0.06	(-0.22; 0.11)
Age					-0.10	(-0.27; 0.07)		-0.07	(-0.24; 0.10)
Educational level - intermediate vs low					0.09	(-0.08; 0.25)		0.06	(-0.11; 0.23)
educational level - high vs low					-0.05	(-0.22; 0.12)		-0.04	(-0.21; 0.13)
<b>block 3</b>							0.241		
Smoking - Former vs current								-0.04	(-0.22; 0.13)
Smoking - Never vs current								0.05	(-0.12; 0.22)
pulmonary function - gold 2 vs gold 1								-0.22	(-0.53; 0.10)
pulmonary function - gold 3 vs gold 1								-0.15	(-0.45; 0.16)
pulmonary function - gold 4 vs gold 1								0.04	(-0.19; 0.25)
SSL12-I								0.14	(-0.03; 0.30)
Years diagnosed with COPD								0.10	(-0.07; 0.27)

Note: SSL12 – I: social support list – interaction, RES: resilience evaluation scale, CCQ: clinical COPD questionnaire

R<sup>2</sup>: adjusted r square

\* P ≤ 0,01 \*\* P ≤ 0,001

**Tabel 4.5**

**Multiple regression outcome CCQ**

	Model 1			Model 2 (block 1 and 2)			Model 3 (block 1.2 and 3)		
	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI	R <sup>2</sup>	Beta	95% CI
<b>block 1</b>	0.25								
RES		-0.50**	(-0.70; -0.37)		-0.49**	(-0.68; -0.35)		-0.46**	(-0.66; -0.31)
<b>block 2</b>				0.26					
Gender					-0.09	(-0.25; 0.08)		-0.07	(-0.23; 0.10)
Age					-0.02	(-0.18; 0.15)		-0.01	(-0.19; 0.16)
Educational level - intermediate vs low					-0.03	(-0.20; 0.13)		-0.04	(-0.21; 0.14)
educational level - high vs Low					-0.19	(-0.35; -0.02)		-0.18	(-0.35; -0.003)
<b>block 3</b>							0.23		
Smoking - Former vs current								-0.02	(-0.20; 0.15)
Smoking - Never vs current								0.03	(-0.15; 0.20)
pulmonary function - gold 2 vs gold 1								-0.02	(-0.34; 0.30)
pulmonary function - gold 3 vs gold 1								0.05	(-0.26; 0.36)
pulmonary function - gold 4 vs gold 1								-0.02	(-0.20; 0.25)
SSL12-I								0.07	(-0.10; 0.23)
Years diagnosed with COPD								0.09	(-0.08; 0.26)

Note: SSL12 – I: social support list – interaction, RES: resilience evaluation scale, CCQ: clinical COPD questionnaire

R<sup>2</sup>: adjusted r square

\* P ≤ 0,01 \*\* P ≤ 0,001