Healthy ageing and salutogenesis in elderly people with multimorbidity

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Abstract

Purpose

The aim of our study is to investigate whether the Brief Assessment of Sense of Coherence questionnaire (BASOC) correlates with the longer Sense of Coherence questionnaire (SOC-29) in a population of elderly people. Furthermore, we want to explore factors that could be associated with the SOC score, like sociodemographic variables, number of chronic diseases and medication use. Finally, we intend to investigate how the SOC scores correlate with the scores on a quality of life questionnaire, a depression scale and the functional status of a person.

Methods

Data for this cross-sectional study were collected in 102 Dutch-speaking patients who were at least 75 years old. Participants were invited to fill in a series of questionnaires: a survey on sociodemographic factors, medical comorbidities and medication use; the SOC-29 questionnaire; the World Health Organisation Quality of Life BREF questionnaire (WHOQOL-BREF); the Geriatric Depression Scale-15 questionnaire (GDS-15); the Katz Activities of Daily Living scale (ADL) and the Lawton Instrumental Activities of Daily Living questionnaire (I-ADL).

Results

We found a linear relation between the BASOC and the SOC-29 (Pearson correlation 0.89; $p < 0.001$). However, BASOC scores overestimated the SOC-29 scores at the high end of the spectrum, resulting in a proportional bias. BASOC couldn't identify the same tertile groups as the SOC-29, since the concordance was only moderate (weighted kappa 0.50; 95%CI 0.37-0.63). We found a significant correlation between SOC scores and WHOQOL-BREF scores (Pearson correlation 0.87; $p < 0.001$). People with the highest tertile SOC scores had significantly less depressive symptoms (R^2 0.22). We did not find a significant association between SOC scores and ADL status, I-ADL scores, age, gender, living with a partner, number of chronic diseases, medication use or use of psychotropic drugs. The multivariable linear regression analysis with SOC scores as dependent variable yielded a model with only WHOQOL-BREF scores and depressive symptoms as associated factors ($R^2 = 0.55$).

Conclusions

Our data suggest that BASOC does not measure SOC in the same way as the SOC-29 questionnaire. SOC scores showed a correlation with QOL scores and were negatively correlated with GDS-15 scores. No significant correlations were found between SOC and functional status, multimorbidity, medication use or sociodemographic variables. There are still some questions to be answered through future research.

What is already known about this topic?

- Healthy ageing is defined by the WHO as the process of developing and maintaining the functional ability that enables well-being in older age.
- Sense of coherence (SOC) is a concept that focuses on factors that support healthy ageing rather than on the ones that impair it. SOC can be measured by means of the SOC-29 questionnaire. Shorter versions (e.g. the BASOC) have been developed as well.
- People with a high SOC have better experienced health, quality of life and life expectancy.

What does this paper add?

- The BASOC questionnaire does not measure SOC in the same way as the SOC-29 does.
- In our sample a strong relation between SOC and quality of life was confirmed. SOC was inversely related to risk of depression.
- We did not find associations between SOC and functional status, number of chronic diseases, medication use, use of psychotropic drugs, age, gender or living with a partner.

1. Introduction

Over the last few decades, our life expectancy increased significantly and therefore the share of elderly people in our society did so as well. In 2019 over 20% of the European population was 65 years or older and more than 5% was over 80 years old.[1] This trend will continue into the future as we expect the group of 80 plus to reach 15% by the year 2100.[1] With this in mind, it isn't surprising that healthy ageing – also named successful, active or productive ageing – has become a popular research topic. The concept of healthy ageing is defined by the WHO as the process of developing and maintaining the functional ability that enables well-being in older age.[2]

In the process of growing older, healthy ageing might be impaired by the development of chronic diseases that can impact quality of life. However, this isn't always the case; elderly people with the same burden of chronic diseases might experience a difference in quality of life[3] and even in life expectancy.[4] One possible explanation for this finding was introduced in 1979 by Aaron Antonovsky with the concept of the sense of coherence (SOC), a model that focusses on factors that support healthy ageing rather than on the ones that impair it.[5–7] SOC can be evaluated with a questionnaire assessing the following 3 components: [5–7]

- Comprehensibility: the extent to which someone perceives an event as making sense, or being consistent and structured;
- Manageability: the extent to which a person feels like he or she can cope with events that happen to them;
- Meaningfulness: the extent to which someone feels like their life is valuable and worthy of commitment.

The original questionnaire assessing SOC consists of 29 statements that have to be scored on a scale of 1 to 7.[5,6] A shorter version consisting of 13 questions has been developed and tested as well.[8] Older persons with higher scores on the SOC questionnaire have better experienced health[3,9], quality of life[9,10] and life expectancy[4,11].

SOC is a relatively stable measure since it is largely based on personality traits that remain stable over time, like someone's temperament or emotional intelligence.[12–14] On the other hand SOC can evolve over time due to certain circumstances like traumatic events[12] or specific interventions like relaxation therapy, cognitive behavioral therapy and physical exercise in order to promote someone's SOC score, even in the elderly.[15–17]

If SOC is an important health indicator, the question rises for practicing physicians how and with which instrument SOC could be assessed routinely. Because of the length of the SOC questionnaire and the time it takes to answer it, this is difficult to practice. This is why Lundberg and Nyström developed the SOC-3.[18] In this questionnaire, each of the 3 components from the SOC questionnaire is evaluated by one question only.[18] Because of the low correlation between the SOC-3 and the SOC-13 and -29[19,20], some new versions have been developed: the Brief Assessment of Sense of Coherence (BASOC) and the University of Tokyo Health Sociology version of the SOC Scale (SOC-3-UTHS).[20,21] The BASOC consists of three items taken out of the SOC-29, namely question 12, 14 and 19.[20] The SOC-3-UTHS consists of three items related to the subordinate concepts of SOC (manageability, comprehensibility, and meaningfulness).[21]

The aim of our study is to investigate whether the BASOC correlates with the SOC-29 in a population of elderly people. Furthermore, we want to explore factors that could be associated with the SOC score, like sociodemographic variables, number of chronic diseases and medication use. Finally, we intend to investigate how the SOC scores correlate with the scores on a quality of life questionnaire, a depression scale and the functional status of a person.

2. Methods

2.1 Study sample

Data for this prospective cross-sectional study were collected in 102 Dutch-speaking patients (57 women and 45 men) who were at least 75 years old at the time of the study, and who consulted their family doctor in one of the two participating practices during the period from July 2021 until December 2022. All patients who met the inclusion criteria were invited to join this study. This was done systematically during each consultation in which a person over 75 years old presented, in order to avoid selection bias. The total number of patients over 75 in the two participating practices approaches 1200, whereas the total amount of people over 75 in Flanders is around 600 000.[22] Of all those who met the inclusion criteria only six people refused to participate, resulting in a sufficiently representative sample in sociodemographic characteristics.

Four exclusion criteria were determined for this study: severe dementia (based on a known Mini-Mental State Examination (MMSE) score of less than 15), severe psychiatric comorbidities, palliative status and patients presenting with a condition that needed immediate care.

The study protocol was approved by the Ethical Committee of the University of Leuven (reference number MP018130).

2.2 Questionnaires

2.2.1 Sociodemographic variables, comorbidities and medication use

Participants were invited to fill in a series of questionnaires, starting with a survey on sociodemographic factors: age, sex (M/V/X), ethnicity, civil status (married/unwedded/divorced/widowed), education (elementary school/secondary school/bachelor's degree/master's degree) and living situation (independent/cohousing with family/service flat/residential care center). Medical comorbidities (hypertension, hypercholesterolemia, arterial vascular disease, cardiac decompensation, cardiac arrhythmia, diabetes, renal insufficiency, chronic lung disease, depression, chronic pain, osteoporosis or any other disease) were listed and measured by means of an unweighted disease count. Previous research has shown that a simple disease count predicts adverse outcomes the same way as the modified Charlson comorbidity index or the Cumulative Illness Rating Scale.[23] A list of the participants' medication (antihypertensives, cholesterol-lowering drugs, anticoagulants, diuretics, antidiabetic agents, antidepressants, antipsychotics, hypnotics, painkillers, osteoporosis medications, proton-pump inhibitors and any other drugs) was included as well.

2.2.2 Sense of Coherence questionnaire (SOC-29)

The SOC-29 questionnaire assesses three components; comprehensibility, manageability, and meaningfulness.[5–7] It consists of 29 statements that have to be scored on a scale of one to seven. The higher the total score on the SOC-29 questionnaire, the higher a person's SOC is. No cutoff values have been defined for this scale. Internal consistency of this scale as measured by Cronbach's α is good, with coefficients ranging from 0.70 to 0.95.[5] The Brief Assessment of Sense of Coherence (BASOC) is derived from the SOC-29 by taking out question 12, 14 and 19.[20]

2.2.3 World Health Organisation Quality of Life BREF (WHOQOL-BREF)

The WHOQOL-BREF questionnaire determines a person's quality of life by means of 26 questions about physical health, mental health, social relations and environmental factors.[24] Questions are scored on a scale of one to five. The WHOQOL-BREF is a shorter version of the WHOQOL questionnaire that consists of 100 questions. Research has proven that the WHOQOL-BREF is a valid an reliable alternative to this longer questionnaire.[24]

2.2.4 Geriatric Depression Scale-15 (GDS-15)

The GDS-15 is a screening tool for depression in the elderly. This questionnaire is a shorter version of the "Geriatric Depression Scale" which consists of 30 questions.[25] It consists of 15 questions that have

to be answered with “yes” or “no”. A score of six or more points on this questionnaire indicates an elevated risk for depression.[26] Reliability and validity of this questionnaire is shown by previous research.[27,28]

2.2.5 Katz Activities of Daily Living scale (ADL)

The ADL scale is used to estimate a person's ability to perform daily activities independently. It has a good validity and reliability.[29,30] The scale questions six activities, namely: personal hygiene, dressing, using the bathroom, moving around indoors, eating and continence.[31] A category varying from A to G is attributed depending on how many items can be done independently:

A. Independent for all six items
B. Dependent for one item
C. Dependent for personal hygiene and one other item
D. Dependent for personal hygiene, dressing and one other item
E. Dependent for personal hygiene, dressing, bathroom use and one other item
F. Dependent for personal hygiene, dressing, bathroom use, moving indoors and one other item
G. Dependent for all items

2.2.6 Lawton Instrumental Activities of Daily Living (I-ADL)

The I-ADL scale was developed to estimate the extent to which a person still masters seven different instrumental skills (telephoning, travelling, shopping, cooking, household chores, medication use and managing finances).[32,33] A score varying from zero to two is attributed to each item; two means a person can do the task independently, one means it can be done with help from others and zero means the person is completely dependent on others for this task. A higher total score means a person is more independent, but there is no cutoff value. The validity and reliability of the I-ADL scale have been proven.[30]

2.3 Data storage

Storage of data will be done with respect for patient privacy according to the rules of the General Data Protection Regulation (GDPR), the European data protection law. For this purpose, each patient record will be coupled to a code consisting of a letter and a number, where the letter depends on the attending physician. The link between the code and the associated patient can only be retrieved again by the physician.

2.4 Data analysis

The total SOC-29 and BASOC scores were tested for normality and transformed into percent scores in order to make interpretation easier. Comparisons of the characteristics of participants with the highest tertile SOC-29 scores and the others were tested with independent Student's t-test (parametric variables), Mann-Whitney U test (non-parametric) and Pearson's chi-squared test (categorical). Agreement between the SOC-29 and BASOC scores for identifying participants with different tertile scores was measured with Cohen kappa coefficient. Pearson correlations (observed and corrected for attenuation) between SOC-19 and BASOC scores were computed. A Bland-Altman plot was used to check for non-linearity of the scores of the SOC-29 and BASOC. Using the SOC-29 scores as a gold standard, ROC-curves were used to explore the accuracy of the BASOC to identify high or long tertile groups. Uni- and multivariable linear regression using SOC-29 scores as a dependent variable were performed to explore associations with background variables. These analyses were performed using SPSS 29.0 (SPSS Inc., Chicago, IL, USA).

3. Results

3.1 Patient characteristics

In total, 108 people were invited to join this study. Only six of them refused. No specific reasons were given. 102 participants with a mean age of 82 (SD 4.8) years old (range 75 – 94 years) were included. 44.1% (n = 45) of the sample was male. An overview of the patient characteristics is shown in Table 1. We compared the characteristics of our total sample with those of the group with high SOC (the highest tertile group) and low SOC (the medium and lowest tertile group).

Table 1: Characteristics of the study participants according to their score on the SOC-29 scale

		Sense of Coherence (SOC)		
	Total population (n=102)	Low SOC [1] (n=68)	High SOC [1] (n=34)	P-value [2]
Sociodemographic characteristics				
Age, mean (SD), years	81.8 (4.8)	81.5 (4.7)	82.3 (5.2)	0.2
Men, number (%)	45 (44.1)	25 (36.7)	20 (58.8)	**0.03**
Family situation, number (%)				
Married	68 (23.5)	43 (63.2)	25 (73.5)	
Divorced	4 (3.92)	4 (5.8)	0 (0)	0.06
Widow or widower	28 (27.4)	21 (30.8)	7 (20.5)	
Single	2 (1.9)	0 (0)	2 (5.8)	
Level of education				
Primary school	26 (25.5)	18 (26.4)	8 (23.5)	
Secondary school	55 (53.9)	38 (55.8)	17 (50)	0.76
Bachelor	17 (16.7)	10 (14.7)	7 (20.5)	
Master	4 (3.9)	2 (2.9)	2 (5.8)	
Other characteristics				
I-ADL score, median (IQR)	13 (4)	12.5 (4)	13 (3)	0.9
ADL categories, n (%)				
A	59 (57.8)	36 (52.9)	23 (67.6)	0.5
B	34 (33.3)	25 (36.7)	9 (26.4)	
C	6 (5.8)	5 (7.3)	1 (2.9)	
D	3 (2.9)	2 (2.9)	1 (2.9)	

[1] High SOC = highest tertile group, low SOC = medium and lowest tertile group

[2] P values are calculated with student -T test for continuous variables with a normal distribution,with the Kruskaul-Wallis test for the variables with a skewed distribution , and with the Chi-square test for the categorial variables.

Disease count, median (IQR)	4 (3.0)	4 (3.0)	3.5 (0.3)	0.9
Psychotropic medication :				
Antidepressants/antipsychotics n (%)	21 (20.5)	16 (23.5)	5 (14.7)	0.29
Hypnotics, n (%)	20 (19.6)	16 (23.5)	4 (5.88)	0.7
Depressive symptoms (GDS score ≥ 6), n (%)	13 (12.7)	13 (19.11)	0 (0)	**0.004**
WHOQOL-BREF score (%), mean (SD)	71.39 (10.18)	67.16 (8.55)	79.83 (7.65)	**< 0.001**
SOC-29 score (%), mean (SD)	64.31 (12.01)	57.40 (7.38)	78,14 (5.96)	**< 0.001**
BASOC score (%), mean (SD)	72.98 (16.04)	66.42 (13.98)	86.11 (11.13)	**< 0.001**

Abbreviations: SD = standard deviation, I-ADL : Instrumental Activities of Daily Living, ADL = Activities of Daily Living, IQR = Interquartile Range, GDS = Geriatric Depression scale

3.2 Relationship between SOC-29 and BASOC

3.2.1 Correlation between SOC-29 scores and BASOC scores

Both the SOC-29 scores and the BASOC scores are distributed normally, as illustrated by Figure 1 and 2. Scores on the SOC-29 variated between 20% and 94%. Scores on the BASOC variated between 25% and 100%.

Figure 1: Distribution of the SOC-29 scores (histogram and PP plot)

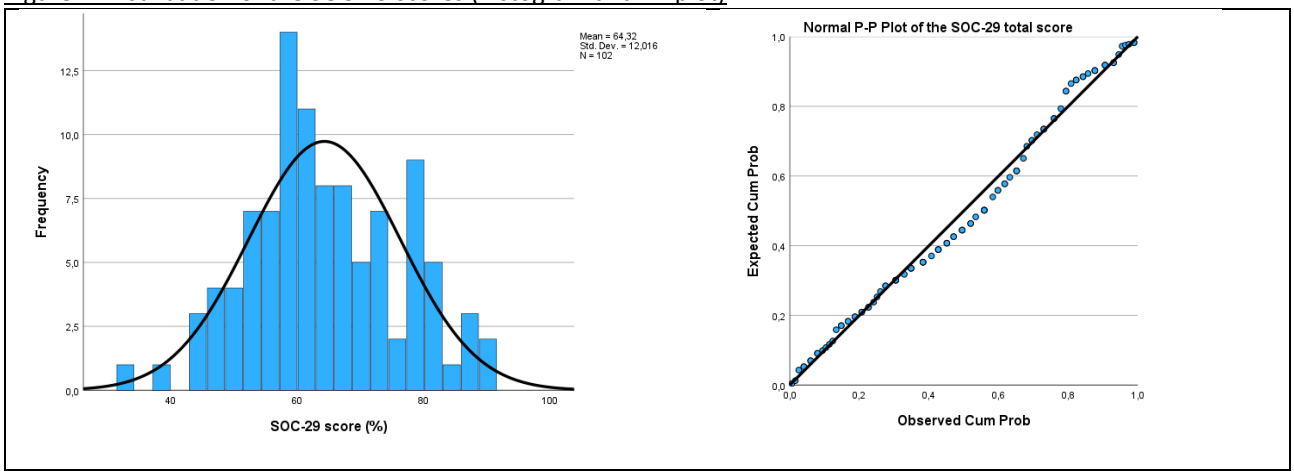
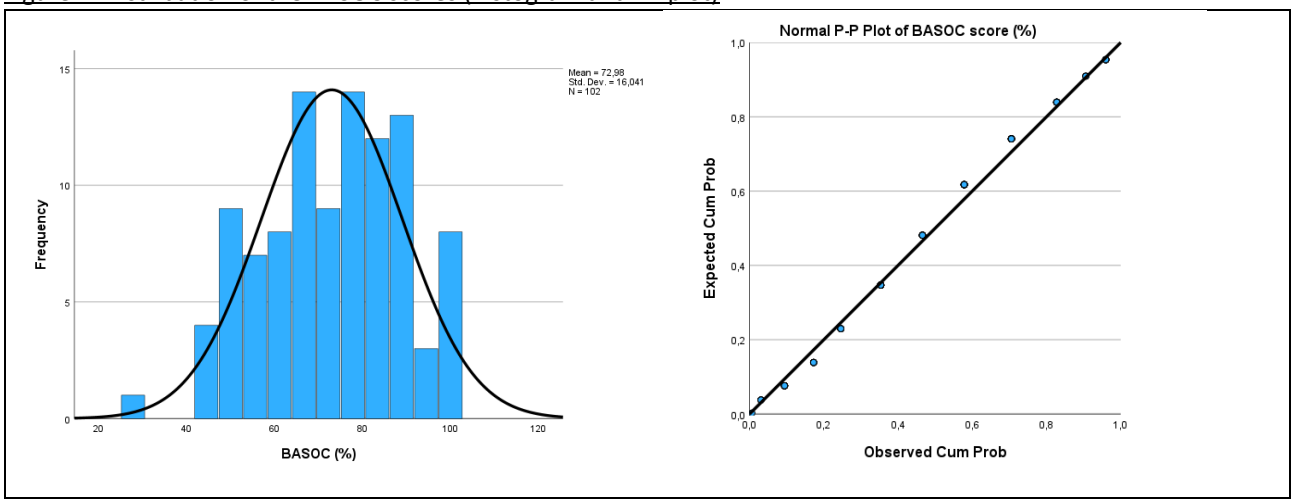


Figure 2: Distribution of the BASOC scores (histogram and PP plot)



The scatterplot (Figure 3) visually shows a linear relationship between the SOC-29 and the BASOC. To measure the strength of this relationship, Pearson correlation was used.[34] It has values varying from -1 to 1, with a value of -1 meaning a totally negative correlation, 0 meaning no correlation, and 1 meaning a total positive correlation. We found a high correlation between the SOC-29 and BASOC scores, illustrated by a Pearson correlation of 0.75 before, and 0.89 after correction for attenuation (Table 2).

Figure 3: Scatterplot of the SOC-29 and BASOC scores

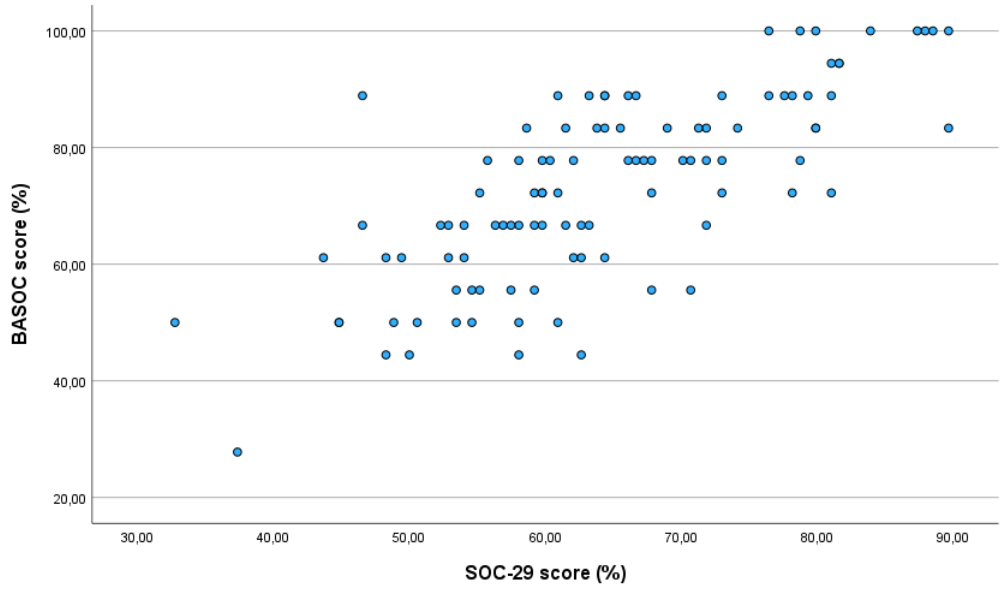


Table 2: Pearson correlation between SOC-29, BASOC and WHOQOL-BREF scores, before and after correction for attenuation[1]

	BASOC (%)	SOC-29 (%)	WHOQOL-BREF (%)
BASOC (%)		0.75 [2]	0.51 [2]
SOC-29 (%)	0.89 [2]		0.72 [2]
WHOQOL-BREF (%)	0.64 [2]	0.87 [2]	

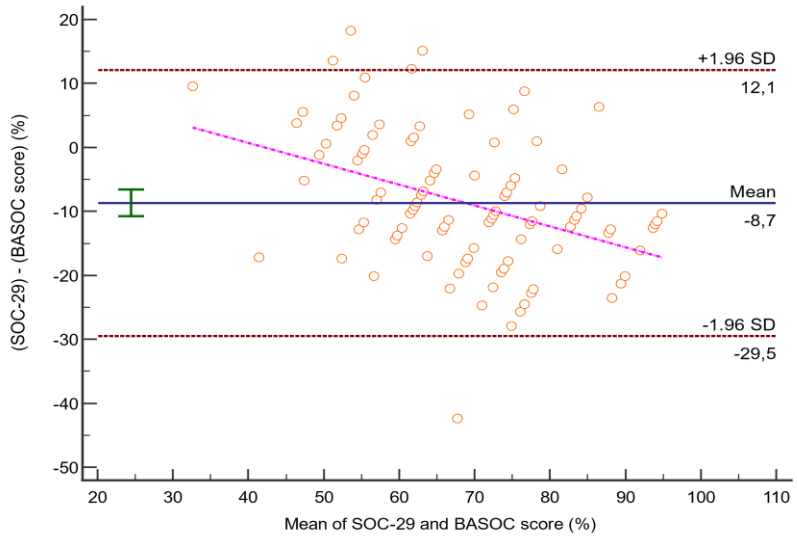
1: The observed as well as the "attenuated" correlation indices are reported because the observed correlation can underestimate the magnitude of the association because of the amount of measurement error. When correlating scores from two instruments, the observed correlation may be substantively lower if the score reliabilities from both instruments are low. To compute corrected correlation coefficients, we used the following formula: $r_{x'y'} = \frac{r_{xy}}{\sqrt{r_{xx} r_{yy}}}$. In this formula, rx'y' is the correlation between the two instruments corrected for attenuation; rxy is the observed correlation and rxx and ryy are the reliability indices of the first and second instrument. In order to compute corrected correlation indexes, the following average test-retest reliability indices were used, based on existing literature: 0.84 for the SOC-29 and 0.78 for the BASOC.

2: Correlation is significant at the 0.01 level (2-tailed).

The Bland-Altman plot (Figure 4) compares the results of the SOC-29 and BASOC. The average of the two measured values is displayed horizontally and the difference in measurements is shown vertically. The mean difference between two measurements is represented by the blue curve and the brown curves stands for the 95% confidence interval. The plot reveals a mean difference of -8,7% (95%CI (+12,1) – (-29,5)) that is not linear at all. This means BASOC scores overestimate the SOC-29 scores at the high end of the spectrum.

Linear regression with difference as a dependent and the mean values as an independent variable yields a bèta of -0.329 ($p < 0.001$), confirming that there is proportional bias.

Figure 4: Bland-Altman plot on SOC-29 and BASOC scores



3.2.2 Concordance between the SOC-29 score and the BASOC score

To identify the concordance between the BASOC and the SOC-29 and to explore if the BASOC can correctly identify the SOC-29 tertile groups we used Cohen's Kappa statistics. Cohen suggested the Kappa result can be interpreted as follows: values ≤ 0 as indicating no agreement, 0.01-0.20 as none to slight, 0.21-0.40 as fair, 0.41-0.60 as moderate, 0.61-0.80 as substantial and 0.81-1.00 as almost perfect agreement.[35]

We found a moderate concordance between the SOC-29 tertile groups and the BASOC tertile groups, shown by a weighted kappa of 0.508 ($p < 0.001$) for the total group of respondents. When looking at the group of respondents with the lowest SOC scores (the medium and lowest tertile group) we found a moderate concordance between the SOC-29 and the BASOC as well, with a weighted kappa of 0.522 ($p < 0.001$). For the group with the highest SOC scores (the highest tertile group) the concordance between these two variables was also moderate with a kappa of 0.519 ($p < 0.001$).

Thus, assuming that the SOC-29 is the gold standard to measure SOC, the BASOC is not a good alternative because it doesn't classify groups in the same way.

Another approach is to determinate the best cut-off value of the BASOC score to identify respectively the highest and the lowest SOC-29 tertile group. We used a Receiver Operating Characteristic Curve (ROC) to do so. We found that the BASOC score with a cutoff value of 66% has the greatest sensitivity and specificity to identify both individuals with highest SOC-29 tertile values (Figure 5) and individuals with lowest SOC-29 tertile values (Figure 6). Thus making the BASOC score of little use for this purpose.

Figure 5: ROC-cure of the BASOC score for individuals with highest SOC-29 tertile values

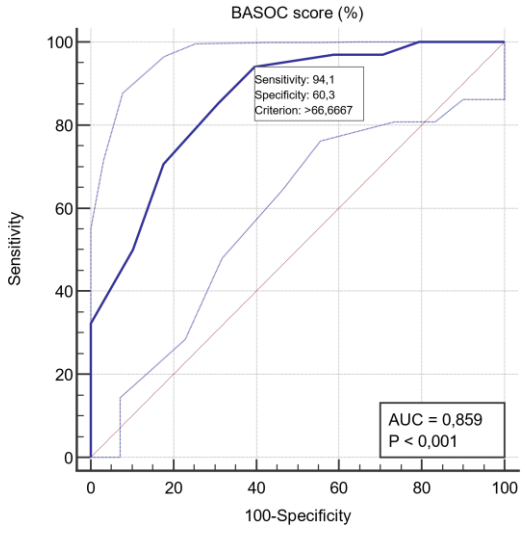
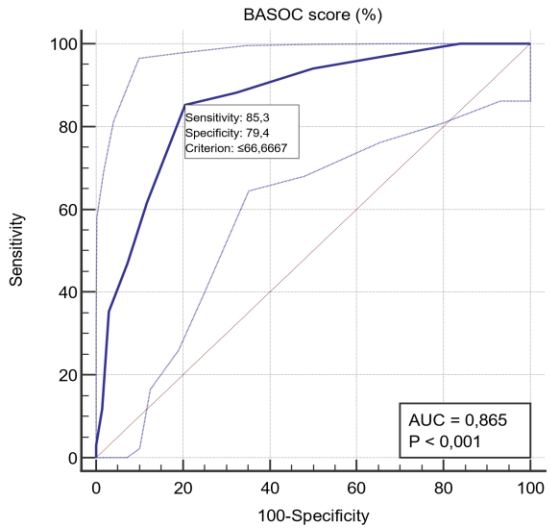


Figure 6: ROC-cure of the BASOC score for individuals with lowest SOC-29 tertile values



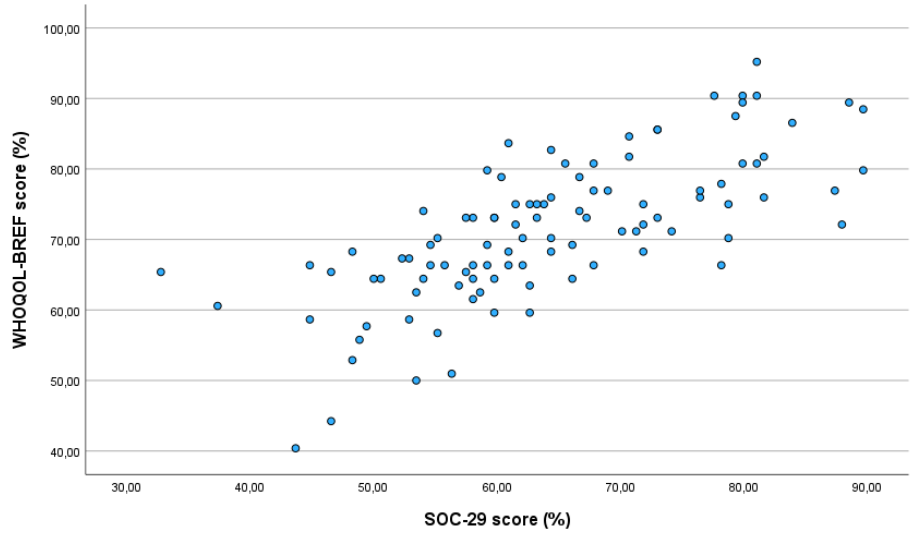
3.3 Association between SOC-29 scores and other variables

3.3.1 SOC and quality of life

SOC scores and WHOQOL-BREF scores showed a linear relation (Figure 7). Pearson correlation was 0.72, and 0.87 after correction for attenuation. This correlation was significant at the 0.01 level (2-tailed).

These findings were confirmed by means of an univariate linear regression ($p < 0.001$). An R^2 of 0.52 was found, meaning that 52% of the variance in SOC scores is accounted for by the WHOQOL-BREF scores.

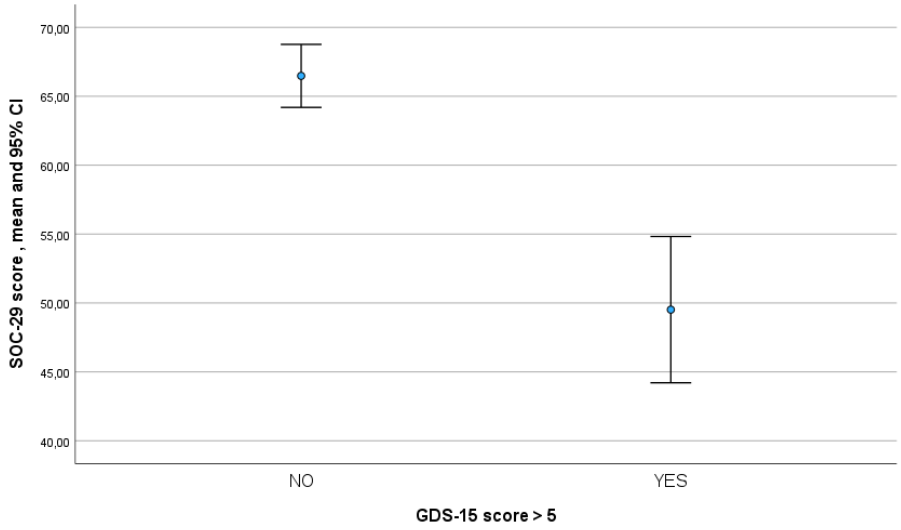
Figure 7: The association between the SOC-29 scores and the WHOQOL-BREF scores



3.3.2 SOC and depression

We found an association between depressive symptoms (defined as a GDS-15 score ≥ 6) and SOC-scores (Figure 8). Participants with depressive symptoms had significantly lower SOC scores ($p < 0.001$).

Figure 8: The SOC-29 scores in participants with and without depressive symptoms (GDS score ≥ 6)



3.3.3 SOC and functional status

Figure 9 shows the distribution of the SOC-29 scores in different ADL groups. Using univariate linear regression, we did not find a significant correlation between SOC-29 scores and ADL ($p = 0.168$).

Figure 9: SOC-29 scores (mean, 95%CI) in participants with different ADL categories.

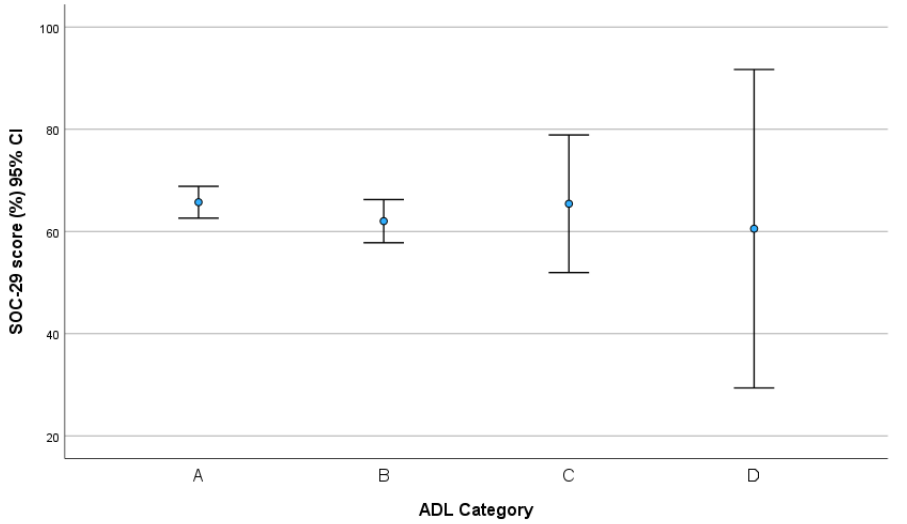
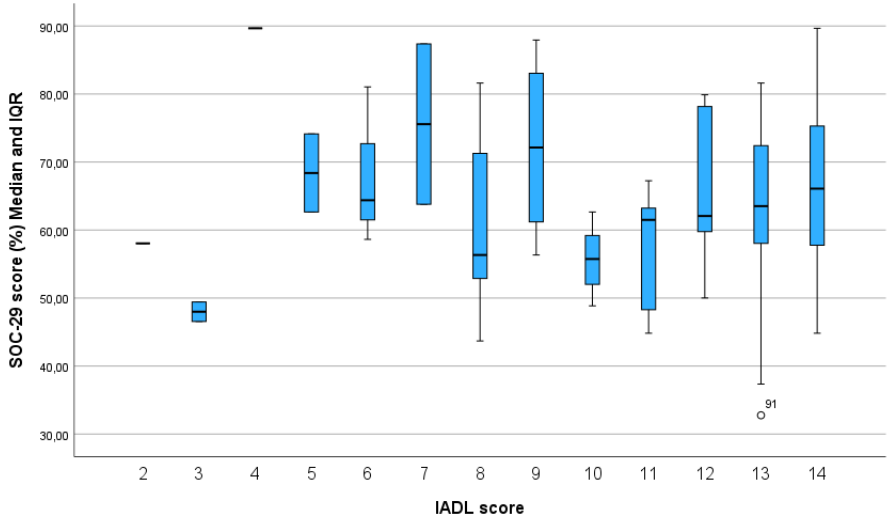


Figure 10 shows the distribution of the SOC-29 scores in patient groups with different I-ADL scores. No significant association was observed.

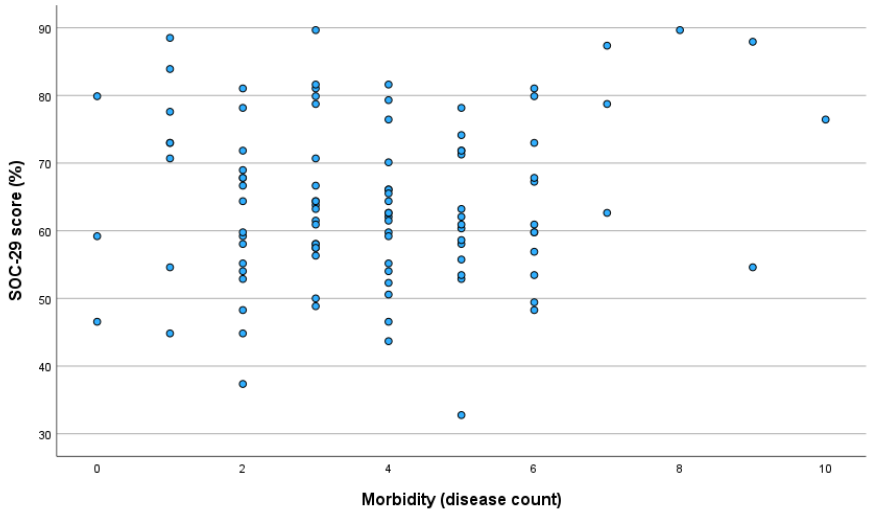
Figure 10: The association between the SOC-29 scores and the I-ADL scores (box plots)



3.3.4 SOC and multimorbidity/polypharmacy

We did not find a significant association between SOC-29 scores and multimorbidity ($p = 0.307$; Figure 11) or polypharmacy ($p = 0.337$). A separate analysis for psychotropic drugs was done, but didn't show any significant results ($p = 0.144$).

Figure 11: The association between the SOC-29 scores and multimorbidity (expressed as disease count)



3.3.5 SOC-29 and sociodemographic variables

As a final research question we studied if a relation between sociodemographic factors (age, male gender and living with a partner) and SOC-29 scores could be found. Univariate linear regression

showed a significant correlation between male sex and SOC (p = 0.043), but with a low R^2 of 0.04. The other variables did not have a significant correlation with SOC-29.

3.3.6 Multivariable linear regression

Linear univariate regression analysis was performed to explore factors that may predict SOC (Table 3). A significant positive association was found for male gender and for WHO-QOL scores whereas the presence of depressive symptoms was negatively associated with SOC-scores.

Table 3: Univariate linear regression analysis using total soc-score as a dependent variable

Variable	Beta (95% CI)	P-value
Age	0.29 (-0.18 to -0.77)	0.22
Male gender	4.84 (0.16to 9.52)	**0.04**
Living with a partner	2.48 (-2.52 to 7.49)	0.32
Depressive symptoms (GDS score > 5)	-16.96 (-23,23 to -10.69)	**< 0.001**
WHO-QOL score	0.58 (0.69 to 1.01)	**< 0.001**
ADL categories	3.33 (-1.42 to 8.09))	0.16
Number of drugs	0.33 (-0.35 to 1.03)	0.33
Psychotropic medicines (Y/N)	-4.31 (-10.11 to 1.44)	0.14
Number of chronic diseases	0.62 (-.057 to 1.82)	0.30
Level of education	1.42 (-1.68 to 4.52)	0.36

After multivariable linear regression, we found that the effect of gender was no longer significant (p = 0.222; Table 4). R^2 for GDS-15 and WHOQOL-BREF together was 0.55.

Table 4: Multivariable linear regression

Dependent variable	Factors associated with SOC	R^2	Beta (95% CI)	P-value
SOC scores		**0.55**		
	GDS > 5		-6.28 (-11.68 to -0.84)	**0.02**
	WHOQOL score		0.74 (0.56 to 0.92)	**<0.001**
	Gender (Male)		2.02 (-1.24 to 5.28)	0.22

4. Discussion

4.1 Main results

In the present study, we investigated whether the results of the BASOC correlated with the results of the SOC-29 questionnaire in a population of 102 Belgian participants aged 75 or older. In general, we indeed found a linear relation between these two questionnaires (Table 2). However, when looking further into the data, we found that BASOC scores overestimate the SOC-29 scores at the high end of the spectrum, resulting in a proportional bias. Furthermore we found that BASOC couldn't identify the same tertile groups as the SOC-29, since the concordance was only moderate.

Our next research question was to investigate how the SOC scores correlate with the scores on a quality of life questionnaire, a depression scale and the functional status of a person. We found a strong correlation between SOC scores and WHOQOL-BREF scores, confirmed by means of linear regression. In our sample, 52% of the variance in SOC scores was accounted for by the WHOQOL-BREF scores. These findings show that SOC and QOL do not measure the same construct, but are strongly connected. SOC scores were found to have a negative association with depressive symptoms (GDS-15 score ≥ 6). Our study did not show any association between SOC scores and ADL or I-ADL status.

Finally, we wanted to explore whether SOC scores showed an association with age, gender, living with a partner, number of chronic diseases, medication use or use of psychotropic drugs. Of all these variables, we only found a significant association between high SOC scores and male sex. However, after multivariable linear regression this association was no longer statistically significant.

4.2 Relationship with previous research

In our study, we found that BASOC scores overestimate the SOC-29 scores at the high end of the spectrum and that BASOC couldn't identify the same tertile groups as the SOC-29. To the best of our knowledge, there are no other studies that compared BASOC and SOC-29 in this way. With the data of this present study, we would conclude that BASOC does not measure the concept of SOC in the same way as the SOC-29 questionnaire does. Therefore the SOC-29 questionnaire remains the gold standard to measure SOC.

We found a strong correlation between SOC scores and WHOQOL-BREF scores. Previous research already showed this positive relationship between SOC and QOL.[36,37] A systematic review by Eriksson et al. found longitudinal studies confirming the predictive validity of the SOC for a good QOL. The authors state that a certain possibility to modify and extend the health construct is becoming

discernible, implicating a construct including salutogenesis and QOL where the SOC concept is a health resource, influencing QOL.[37]

Knowing that there is this strong relationship between SOC and QOL, it would be interesting to modulate them both by means of certain interventions. A previous longitudinal study by Lövheim et al. studied changes in SOC in people aged 85 or more. They found that there is a risk of decreased SOC and thereby quality of life when negative life events accumulate among elderly people. The authors suggested that nursing interventions (like retreat programs with psychosocial support, discussion about spiritual concerns, or interventions that include close social network) might play an important role for maintaining and perhaps strengthening SOC among old people exposed to negative life events.[38] Furthermore, other studies have shown that relaxation therapy, cognitive behavioral therapy and physical exercise can promote a person's SOC score.[15–17]

In our study SOC scores showed a negative association with depressive symptoms (GDS-15 score ≥ 6). These findings are in line with previous research. A cross-sectional study by Guo et al. showed that SOC is negatively and significantly associated with depression, and after multiple regression analyses they found that SOC has a partial mediation effect between perceived stress and depression.[39] Another cross-sectional study by López-Martínez et al. also showed that SOC was inversely related to depression, after controlling for objective burden, sex and kinship.[40]

We didn't find any association between SOC scores and ADL or I-ADL status. A previous prospective cohort study by Boeckxstaens et al. showed an inverse correlation between SOC scores and ADL status.[4] Possibly we could not demonstrate this in our study since only a small portion of our sample had a very low ADL score. 5% of our population lives in a residential care center, whereas this is around 10% in the whole population of people aged 75 or more in Flanders.[41]

Furthermore, the study by Boeckxstaens et al. found a correlation between a high SOC and ADL decline, though the relationship did not reach significance.[4] Our study did not have a longitudinal design, so we can't say anything about evolution in ADL over time. Thus it would be interesting to follow this group over time, to observe the evolution in ADL and the relationship with SOC.

In our sample, SOC scores were not associated with age, gender, living with a partner, number of chronic diseases, medication use or use of psychotropic drugs. These findings are in line with a study by Nilsson et al.: they did not find an association between SOC scores and gender or presence of chronic diseases.[42] When comparing two age groups (25-44 years old versus 45-74 years old), they found that the older group had higher SOC scores. A prospective cohort study by Boeckxstaens et al. did show a relationship between SOC and some of these variables. Their study demonstrated that high

SOC was associated with male sex and being married.[4] On the other hand SOC was inversely related to multimorbidity.[4]

4.3 Implications of our study

Our study showed that SOC is strongly connected to quality of life, and negatively associated with presence of depressive symptoms. On the contrary, SOC wasn't related to functional decline, multimorbidity or polypharmacy. These findings are in line with the definition of SOC as a model that focusses on factors that support healthy ageing rather than on the ones that impair it. This makes SOC an interesting parameter to measure, because it tells us something about the resilience of a patient and about why people with the same burden of disease may have a different perceived health. Yet there are still some questions to be answered.

First of all the question rises how to implement this measurement of SOC in practice. A shorter version of the SOC-29 would be really interesting to use during shorter patient contact like during a consultation with the family doctor. However, in our study the BASOC didn't measure the same construct as the SOC-29. For the moment, a possible alternative for a shorter questionnaire could be the SOC-13.[8,43] Previous research found this questionnaire to be a valid alternative to the SOC-29. We doubt that it would be possible to develop a version with only three questions to replace the SOC-29, since it probably wouldn't capture the same nuance.

Furthermore, there are no strict cut-off values for the SOC-29 questionnaire at the moment. Thus it is not clear how high the SOC needs to be in order to improve healthy ageing. In our study we used the highest tertile to define a high SOC. Possibly these cut-off values can be determined in the future.

Finally, if we were able to measure SOC in patients, then a next step would be to further examine the factors through which SOC can be improved, and how to implement these in practice. All of the questions above could be investigated in future studies.

4.4 Strengths and limitations

Our study was based on a rigorous prospective sampling method, and clearly formulated in- and exclusion criteria were defined. Participants were asked to fill in an extensive questionnaire in which many background data were captured. Furthermore, an analysis of both SOC-29 and BASOC was done. Because of the fact that the participants were asked to join our study when visiting their own family doctor, only very few of them declined. Additionally we had no missing data.

A limitation of our study is the cross-sectional design and the limited number of participants. The questionnaires we used in our study did not ask anything about earlier life events that might have

contributed to the construction of SOC. In the current study we found significant associations, but in order to determine causal relations further longitudinal research is required. In that way we can observe the possible evolution in the SOC scores itself, and in their relation with other variables.

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Appendix

Personal reflection Lore Bekaert

Voor het schrijven van de masterproef in de master-na-masteropleiding huisartsgeneeskunde aan de KU Leuven werkte ik samen met Olivia Claes. We kenden elkaar reeds goed voor we samen startten aan het schrijven van de masterproef en we vermoedden reeds dat we goed zouden kunnen samenwerken. Op het moment dat we de mogelijke onderwerpen voor het schrijven van een masterproef te zien kregen aan het begin van onze opleiding huisartsgeneeskunde bleek al snel dat onze interesses heel gelijk lopend waren en dat we beide interesse hadden in dezelfde onderwerpen. Onze voorkeur ging uit naar het onderzoeksonderwerp “Healthy ageing and salutogenesis in elderly people with multimorbidity”. We contacteerden de promotor, professor Jean-Marie Degryse via mail en spraken begin oktober 2020 af voor een kennismaking en eerste brainstorm sessie over het onderwerp via Zoom. We waren hierna allebei enthousiast over het onderwerp en kozen ervoor hier samen onze masterproef over te schrijven, onder begeleiding van professor Degryse en met professor Bert Vaes als co-promotor. In de periode van november 2020 tot januari 2021 spraken we nog twee keer online af om onze definitieve aanmelding voor dit onderwerp te kunnen insturen en om onze onderzoeksvragen duidelijk af te bakenen. Zo kwamen we uit bij drie vragen die we wilden beantwoorden.

De samenwerking verliep naar mijn aanvoelen erg vlot. Na elk contact met onze promotor, professor Degryse, spraken Olivia en ik af wie welk deel voor haar rekening zou nemen om dan nadien kritisch elkaars tekst te beoordelen en zo nodig aan te passen waardoor we steeds kort op de bal konden spelen. Het fijne aan de samenwerking met Olivia was dat we elkaar goed aanvulden. Ik hield me graag bezig met het opzoeken van relevante artikels over ons onderwerp, we hebben beide een vlotte pen en Olivia is technisch sterker dan ik, waardoor zij zich ontfermde over het toevoegen van referenties via Mendeley, de opmaak van onze masterproef, de aanmaak van een tabel in Excell, … We spraken telkens een duidelijke deadline af tegen wanneer we elk ons deel zouden doorsturen zodat we dit nog tijdig konden aanpassen tegen de volgende meeting met professor Degryse. Praktisch werkten we hiervoor in een dropbox map waartoe we allebei toegang hadden. Hierdoor konden we steeds meteen elkaars aanpassingen raadplegen. We zorgden er ook altijd voor dat onze vorige versie zo nodig terug te raadplegen was als we twijfelden over bepaalde aanpassingen.

Midden februari 2021 konden we al onze eerste versie van het abstract en ons protocol doorsturen en nadien bespreken met professor Degryse. Kort nadien kregen we ook de goedkeuring van de ethische commissie en konden we na toevoeging van een informed consent en patiëntenfolder met informatie voor mogelijke deelnemers aan de slag met het includeren van patiënten. Hiermee startten

we in juli 2021, elk in de huisartsenpraktijk waar we op dat moment actief waren als HAIO. Het verzamelen van onze data nam het meeste tijd in beslag, aangezien we elk minimum 50 ouderen dienden te includeren. Olivia en ik hielden elkaar op de hoogte van onze voortgang en zorgden dat we ongeveer samen dit aantal bereikten. Uiteindelijk haalden we in december 2022 de kaap van 100 geïncludeerde patiënten. Hierna konden we overgaan tot het verwerken van onze verzamelde data. Hierbij heeft professor Degryse ons enorm goed begeleid. Hij heeft de statistische analyse op zich genomen en hiervoor zijn we hem zeer dankbaar. Het was leuk om te zien dat bij het schrijven van de resultaten sectie alles mooi samen viel en we conclusies konden trekken uit onze data analyse. De discussie volgde daarna ook al snel. Uiteraard bleven er nog heel wat vragen onbeantwoord die onderwerp kunnen zijn van verder onderzoek.

Wat ik vooral meeneem na het schrijven van onze masterproef en wat dus volgens mij ook interessant kan zijn voor het werkveld is dat een oudere persoon veel meer is dan zijn of haar comorbiditeiten. Het is niet omdat iemand ziek is of veel chronische aandoeningen heeft dat hij of zij daarom ook minder gelukkig in het leven staat. Het kan daarom heel interessant zijn om net op zoek te gaan naar die zaken die bijdragen tot een goede gezondheid en ervaren levenskwaliteit dan te focussen op die zaken die een goede gezondheid belemmeren en dit kan onder andere aan de hand van de sense of coherence. Dit concept wordt bevraagd aan de hand van een vragenlijst van 29 vragen en betekent letterlijk “gevoel van samenhang”, maar een betere vrije vertaling zou kunnen zijn “psycholgische weerbaarheid”. Het zegt iets over hoe mensen omgaan met stressvolle gebeurtenissen in hun leven en hoe ze gezond blijven. We zien dat mensen die hoog scoren op deze vragenlijst een betere ervaren gezondheid, levenskwaliteit en levensverwachting hebben. Als huisarts is het dus belangrijk om niet alleen te kijken naar de ziektelast, maar net naar hoe iemand hier mee omgaat. Zo kan het interessant zijn om mensen met een lage sense of coherence extra te gaan ondersteunen of door bepaalde interventies ervoor te zorgen dat hun sense of coherence verbetert. Als huisarts staan we immers heel dicht bij onze patiënten en kunnen we hier een belangrijke bijdrage in leveren. Het blijft echter nog even wachten op een vlotte manier om deze sense of coherence te bevragen. Jammer genoeg blijkt uit ons onderzoek dat de vragenlijst momenteel nog niet herleid kan worden tot 3 vragen. Er bestaat al wel een alternatief met maar 13 vragen.

Personal reflection Olivia Claes

Hieronder zal ik in een korte tekst een persoonlijke reflectie geven op het verloop en de uitkomst van onze masterpaper met als onderwerp “Healthy ageing en de rol van salutogenesis bij 75-plussers met multimorbiditeit”.

Het hele proces is naar mijn mening algemeen vlot en aangenaam verlopen. Mijn thesispartner Lore Bekaert en ik waren voordien al vriendinnen, en gezien we veel gemeenschappelijke interesses bleken te hebben en we ook graag samen aan iets wilden werken, beslisten we om met twee de masterproef te schrijven. Na een eerste contact met onze promotor, prof. Jan Degryse, waren er enkele thema’s die onze belangstelling gewekt hadden. In overleg met elkaar en de professor viel uiteindelijk snel de beslissing om te kiezen voor ons huidige onderwerp gezien dit ons allemaal het meeste aansprak.

Concreet zouden we in onze thesis werken rond het thema van de “sense of coherence” of SOC. Dit is een concept wat gemeten kan worden aan de hand van een vragenlijst die peilt naar de mate waarin een persoon zijn leven betekenisvol vindt, het gevoel heeft in staat te zijn om met bepaalde gebeurtenissen om te gaan, en gebeurtenissen verstaanbaar vindt. In het verleden werd al aangetoond dat mensen die hoog scoren op de SOC-vragenlijst een betere kwaliteit van leven hebben en zelfs een betere overleving. In onze paper zouden we nagaan of een korte versie van deze vragenlijst bruikbaar is, en of er bepaalde factoren zijn die gecorreleerd zijn met hogere of lagere SOC-scores.

Initieel startten we met het inlezen in de materie en het schrijven van een eerste versie van de inleiding. Van bij de start was er een goede samenwerking waarbij we elk apart artikels opzochten en informatie verzamelden, maar ook regelmatig afspraken onze ideeën samen te brengen. Lore en ik vulden elkaar hierbij goed aan en we hielpen elkaar waar nodig. Naar mijn aanvoelen was er dus van begin af aan een fijne samenwerking waarbij het werk ook evenredig verdeeld werd.

Na het initiële opzoekingswerk begonnen we met de data-collectie, waarbij we beiden in onze stagepraktijken vragenlijsten lieten invullen door 75-plussers die voldeden aan onze in- en exclusiecriteria. Dit proces vraagt natuurlijk wat tijd, zeker aangezien we als HAIO algemeen iets meer jongeren zien in vergelijking met 75-plussers. Zelf heb ik veel hulp gehad van mijn collega’s in de praktijk, die mee hebben geholpen met zoeken naar geschikte deelnemers. Ik wil hen hiervoor dan ook nog eens heel erg bedanken. Lore en ik waren allebei gemotiveerd om ons vooropgestelde doel van 100 deelnemers te behalen voor eind 2022, en dit is dan ook gelukt. We hebben uiteindelijk beiden rond de 50 deelnemers kunnen includeren, dus de inspanningen zijn zeker goed verdeeld geweest hierbij. Ons finale aantal deelnemers was 102, waar zowel wij als onze promotor zeer tevreden mee waren.

De statische analyses voor verwerking van de data zijn gebeurd door onze promotor prof. Degryse, waarvoor we hem erg dankbaar zijn. Nadat hij al deze resultaten had verwerkt, konden wij beginnen met het schrijven van de resultatensectie van onze paper. Onze promotor had alle analyses duidelijk uitgelegd waardoor we de resultaten zelf gemakkelijk konden interpreteren en het schrijven van dit onderdeel dus eigenlijk vlot ging. Sommige resultaten van onze paper waren zeker te verwachten (bv. dat er een duidelijk verband bestaat tussen de resultaten van de sense of coherence vragenlijst en een quality of life vragenlijst). Anderen waren dan weer eerder verrassend (bv. het feit dat er geen verband aangetoond werd tussen SOC-score en de functionele status van een persoon uitgedrukt als ADL en I-ADL score). Voor ons was het leuk om al deze data te kunnen zien en interpreteren, omdat dit het resultaat was van alle vragenlijsten die we de maanden voordien afgenomen hadden.

Voor het schrijven van de discussie hebben Lore en ik ons initieel gefocust op enkele aparte topics. Zoals steeds maakten we goede afspraken over wanneer we een eerste versie klaar wilden hebben. Nadien hebben we alles bij elkaar gevoegd om samen het geheeld verder in detail uit te werken. Dit was een moeilijker deel van de paper om te schrijven, gezien er net zoals bij de inleiding wel wat opzoekingswerk aan vooraf ging. Anderzijds was het ook erg interessant om onze resultaten op die manier in perspectief te zien met voorgaande studies, en om na te denken over wat er over dit onderwerp verder nog onderzocht dient te worden.

Wat ik zelf vooral ga meenemen vanuit onze masterpaper, is dat we voor het verbeteren van de kwaliteit van leven en de overleving van onze patiënten niet enkel moeten kijken naar het lichamelijke. Hierbij is de sense of coherence een belangrijk concept, dat echter nog niet volledig begrepen is. Onze studie heeft alvast aangetoond dat de SOC-score niet bepaald kan worden met slechts drie vragen. Toekomstige studies zullen hopelijk uitwijzen hoe we dit concept dan wel op een adequate manier kunnen nagaan bij patiënten. Een volgende stap is dan om bij patiënten met lage scores interventies te doen waardoor hun SOC-score verbeterd kan worden.