

Factors Associated with Life Satisfaction in Older Adults with Chronic Pain (PainS65+)

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Background: Chronic pain in later life is a worldwide problem. In younger patients, chronic pain affects life satisfaction negatively; however, it is unknown whether this outcome will extend into old age.

Objective: This study examines which factors determine life satisfaction in older adults who suffer from chronic pain with respect to socio-demographics, lifestyle behaviors, pain, and comorbidities.

Methods: This cross-sectional study recruited a random sample of people ≥ 65 years old living in south-eastern Sweden ($N = 6611$). A postal survey addressed pain aspects and health experiences. Three domains from the Life Satisfaction Questionnaire (LiSat-11) were used to capture the individual's estimations of overall satisfaction (LiSat-life), somatic health (LiSat-somhealth), and psychological health (LiSat-psychhealth).

Results: Respondents with chronic pain (2790, 76.2 ± 7.4 years old) rated lower on life satisfaction than those without chronic pain, with medium effect size (ES) on LiSat-somhealth ($r = 0.38$, $P < 0.001$) and small ES on the other two domains ($r < 0.3$). Among the respondents with chronic pain, severe pain (OR 0.29–0.59) and pain spreading (OR 0.87–0.95) were inversely associated with all three domains of the LiSat-11. Current smoking, alcohol overconsumption, and obesity negatively affected one or more domains of the LiSat-11. Most comorbidities were negatively related to LiSat-somhealth, and some comorbidities affected the other two domains. For example, having tumour or cancer negatively affected both LiSat-life (OR 0.62, 95% CI 0.44–0.88) and LiSat-somhealth (OR 0.42, 95% CI 0.24–0.74). Anxiety or depression disorders had a negative relationship both for LiSat-life (OR 0.54, 95% CI 0.38–0.78) and LiSat-psychhealth (OR 0.10, 95% CI 0.06–0.14).

Conclusion: Older adults with chronic pain reported lower life satisfaction but the difference from their peers without chronic pain was trivial, except for satisfaction with somatic health. Pain management in old age needs to consider comorbidities and severe pain to improve patients' life satisfaction.

Keywords: chronic pain, life satisfaction, older adults, comorbidity

Introduction

Chronic pain in later life is a worldwide problem. The prevalence of chronic pain is known to increase with advancing age, ranging between 25% and 76% in the general elderly population and up to 93% of elderly in residential care.¹ Since the world population is aging rapidly and life expectancy is increasing, more and more older people will face facing chronic pain and its consequences.² In younger patients, chronic pain can result in activity limitations in everyday life both during work and leisure time,^{3–5} and these limitations might extend into the old age, increasing the incidence of frailty.⁶ In addition, chronic pain in younger patients

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decreases life satisfaction.^{4,7} Currently, little is known about how chronic pain affects life satisfaction in older adults; an area that needs more research.

Life satisfaction reflects how people perceive the difference between their reality and their needs or desires with respect to several important domains of functioning and activity/participation.⁸ In general, life satisfaction is a construct of subjective wellbeing related to how people evaluate the quality of specific aspects of their lives such as work, marriage, health, recreation, religion as well as the quality of the more general aspects of their lives such as happiness, morale, zest for life, and peace of mind.⁹ In the pain management and rehabilitation context, it is known that the rational aspect of life satisfaction is a result of an individual's coping and adaption process.^{10,11} There is reason to believe that older adults perceive their life satisfaction lower than young people due to their accumulating exposure of disease burden and the general negative effects of aging. However, research has found that in high-income countries people in later life were more satisfied with their lives than middle-aged people.^{12,13} Moreover, older adults with chronic pain despite greater physical impairment were found to have comparable health status, similar pain intensity, and better mental health compared to younger patients.¹⁴

An older population has many aspects other than socio-demographic characteristics that differ from a younger population.^{12,15-17} For example, comorbidity and multimorbidity,¹⁸ including pain-related comorbidities,^{19,20} are very common in the older adults. Studies have found that older adults with chronic medical illnesses/conditions have lower life satisfaction.^{21,22} In addition, life satisfaction is influenced by lifestyle factors. In general, life satisfaction in aging populations is related to lifestyle behaviours.^{12,23} For example, smoking, alcohol consumption, and obesity are known to be related to chronic pain,²⁴⁻²⁶ but these are seldom addressed in pain research on life satisfaction.

Many studies have focused on general aging populations^{15,21,27,28} and specific aging characteristics²⁹⁻³¹ to investigate life satisfaction in relation to social, physical, mental, and financial aspects. However, only a few studies have investigated life satisfaction in relation to chronic pain in the older adults. For example, Karadag Arli et al reported that pain in older patients is one of the most frequently reported health problems that negatively affect life satisfaction,²² and Yang et al demonstrated that pain is the most common condition in geriatric syndrome associated with low life satisfaction.³² However, these conclusions are

based on the comparisons of older adults with or without pain symptoms and do not analyze crucial factors such as specific pain characteristics within the groups with chronic pain.

Given this background, more knowledge is needed about factors contributing to life satisfaction in older adults with chronic pain. Such knowledge may stimulate the development of prevention and intervention strategies to help older adults maintain and increase life satisfaction despite chronic pain. To fill this gap in knowledge, this study investigates the following research questions:

1. How do older adults with and without chronic pain experience life satisfaction?
2. What factors (e.g., lifestyle behaviors, pain aspects, and comorbidities) are associated with overall life satisfaction (life as a whole), somatic health, as well psychological health in the older people with chronic pain?

Methods

Study Population

This study is part of a large Swedish population-based study of the elderly (cohort PainS65+).³³⁻³⁶ Data collection was a cross-sectional design with a stratified random sample of 10,000 older adults (≥ 65 years old) based on five age strata (65 to 69 years, 70 to 74 years, 75 to 79 years, 80 to 84 years, and 85 years and older) from the Swedish Total Population Register for the two large cities (Linköping and Norrköping) in a south-eastern county (Östergötland) of Sweden.³³⁻³⁶ Data were collected by Statistics Sweden (SCB). A postal survey addressing pain aspects and health experiences were mailed in October 2012 and data collection closed in January 2013. Two reminders at two-week intervals were mailed if necessary.

Measurements

Life Satisfaction

The survey included three items from the Fugl-Meyers Life Satisfaction Questionnaire (LiSat-11), which captures the respondent's estimation of satisfaction with life as a whole (LiSat-life) as well as satisfaction on ten specific domains.¹¹ The present study evaluates satisfaction with life as a whole (LiSat-life), somatic health (LiSat-somhealth), and psychological health (LiSat-psychhealth). Each item is rated on a 6-point response Likert scale

ranging from very dissatisfied to very satisfied: 1 = very dissatisfied; 2 = dissatisfied; 3 = rather dissatisfied; 4 = rather satisfied; 5 = satisfied; and 6 = very satisfied. The scale was dichotomized into satisfied (very satisfied and satisfied) and dissatisfied (very dissatisfied, dissatisfied, rather dissatisfied, and rather satisfied), a dichotomization used by the developers of this instrument⁸ as well as others.^{7,30} The LiSat-11 has been validated for Swedish adults (men and women aged 18–74 years),¹¹ and the reliability test for the present study (Cronbach's alpha 0.80) suggested good internal consistency.

Chronic Pain Aspects

Chronic pain was defined by a single question and one follow-up question with respect to the presence and time course of pain: "Do you usually have pain?" (yes/no) and "If yes, has your pain lasted fewer than 3 months or more than three months?". The subjects who responded that they had pain for more than 3 months were categorized as chronic pain and those who responded that they had no pain or pain for less than 3 months were categorized as no chronic pain.

The respondents with chronic pain were asked to assess their pain intensity and severity over the preceding 7 days using an 11-point numeric rating scale (NRS) (0 = no pain and 10 = worst imaginable pain). Good validity in experimental conditions was reported.³⁷ Scores 0–3, 4–6, and 7–10 correspond to no/mild, moderate, and severe pain. These labels rather than the scores might more adequately represent the respondents' perceptions in clinical practice. The cut-offs for NRS for definitions of pain severity vary in the literature.^{38–41} In this study, we selected the cut-offs because severe pain makes it difficult for individuals to partake in daily living activities.^{41,42}

To assess pain spreading, we asked the respondents to mark their painful sites for the previous 7 days on a body manikin divided into 45 sections on the front and on the back.^{43,44} From these sections, we identified 23 anatomical pain sites and developed an index for the total number of anatomic pain sites (APS), ranging from 0 to 23.⁴⁵ Higher values indicate higher spreading of pain (multi-site pain).

Lifestyle Behaviors

We used the instrument Health Curve (*Hälsokurvan*)⁴⁶ to gather data on health behaviors. Four questions from the instrument were used to assess smoking and snuff use with respect to frequency (from never to daily), number of cigarettes per day (1 to 9; 10 to 19; and 20 or more), and

number of snuff boxes per week (1 to 3 per week and 7 or more per week). Five questions were used to assess alcohol habits. For those who confirmed alcohol consumption, Cut-down, Annoy, Guilty, and Eye-opener (CAGE) questions were used to screen possible alcohol addiction problems. A score of ≥ 2 was considered as high alcohol consumption, indicating potential problems with alcohol abuse.⁴⁷

Body mass index ($\text{BMI} = \text{weight (kg)}/\text{height (m}^2\text{)}$) was calculated based on self-reported body height and weight. BMI was classified according to the criteria developed by the World Health Organization (WHO): <18.5 = underweight; $18.5\text{--}24.9$ = normal range; $25.0\text{--}29.9$ = overweight; and ≥ 30.0 = obesity.

Comorbidities

Assessing comorbidities were assessed using 12 items covering different common comorbidities: 1) traumatic accident/injuries; 2) rheumatic arthritis and osteoarthritis; 3) cardiovascular diseases (including high blood pressure, angina pectoris, and heart attacks); 4) diseases of airways or lungs; 5) low mood and depression; 6) anxiety; 7) diseases of the gastrointestinal organs; 8) diseases of the nervous system including eyes and hearing problems; 9) diseases of the urogenital organs; 10) skin diseases; 11) tumors and cancer; and 12) metabolic diseases (including diabetes, obesity, anorexia bulimia, and struma). The respondents have five answer options: a) No; b) Yes, both according to my and my doctor's opinions; c) Yes, according to my own opinion; d) Yes, according to my doctor's opinion; and e) Do not know. The presence of a comorbidity was determined using the answers from b or d as these were doctor assessments.

Other Factors

Sociodemographic Variables

Age, sex, and educational level were gathered from the respondents' answers in the survey. Statistics Sweden (SCB) supplied information about marital status, country of origin, and yearly income (Swedish Crowns 0–150 000, 150 001–220 000, and 220 001 and over³³) from the Swedish population register.

Leisure Time Activity Level

The MPI (Multidimensional Pain Inventory) is a self-report questionnaire constructed to measure psychosocial, cognitive, and behavioral effects of chronic pain. In the present study, questionnaire measured psychosocial, cognitive, and behavioral effects of chronic pain.^{48,49} We

chose five scales concerning leisure activities according to the Swedish version of MPI (MPI-S).⁵⁰ These subscales were summarized and divided by the number of items answered (not all subjects answered items concerning car and relatives) to form a leisure index (MPI-leisure) according to the validation of the Swedish version of MPI-S. A higher index indicates a higher level of leisure activity.

Sleep Disorders

All the participants were asked whether they had sleep problems or not. They were also asked to rate their sleep problems using the Insomnia Severity Index (ISI). ISI is a reliable and valid instrument for detecting cases of insomnia and has excellent internal consistency.⁵¹ Each item is rated on a 5-point Likert scale (0–4). A sum of the seven items generates the score between 0 and 28. A score of 15 and over is defined as clinical insomnia.^{51,52} In this study, sleep disorders were determined as self-perceived sleep problems or clinical insomnia (ISI ≥ 15).

Social Support

Initially, we chose three questions from the Oslo-3 Social support Scale (OSS-3) to measure social support.^{53,54} Due to frequent answers of “not know, no idea” in two questions, we ended up using only one question: “How many people are so close to you that you can count on if you have great personal problems? (none, 1–2, 3–5, or 5+)”.

Statistics

The statistics were performed using the statistical package IBM SPSS Statistics (version 25.0; IBM Inc., New York, USA). Level of significance was set to <0.05 in all tests. Continuous data are reported as the mean and standard deviation (SD) or median (interquartile range, IQR) based on the gaussian distribution. The categorical data are represented as *n* (%). Student's independent *t* test and Mann–Whitney *U*-test were used for the continuous variables and Chi-square tests were used for categorical data. Spearman's rho non-parametric rank correlation was used to analyse correlations of three LiSat-11 domains with continuous and ordinal variables. To investigate within group differences, we used Mann–Whitney *U*-test and calculated effect size (ES, $r = z/\sqrt{N}$)⁵⁵ to quantify the differences between respondents with or without chronic pain. The ES (*r*) was considered large if ≥ 0.5 , medium if 0.3–0.5,

and small if 0.1–0.3.^{55,56} Floor and ceiling effects were calculated and considered present if more than 40% of the patients scored the lowest or highest score on the three LiSat domains.⁵⁷ Multivariate logistic regression, a forward (likely ratio, LR) method, was used by entering each variable forwardly and removing the least significant variables from the model until all remaining variables were significant ($P < 0.05$ or $P \geq 0.1$ for entry or removal, respectively). LiSat-life, LiSat-somhealth, and LiSat-pschhealth were treated as binary dependent variables: 1 = satisfied and 0 = not satisfied. We used the Hosmer and Lemeshow test where a *P*-value greater than 0.05 indicated good fit of the model. Socio-demographic variables, lifestyle behaviours, pain profiles, general activity level, social support, and comorbidities served as independent variables. Multicollinearity was assessed by examining tolerance and the variance inflation factor (VIF).^{58,59} We further examined problems of collinearity among the categorical variables using the phi (Φ , $\Phi \geq 0.30$ indicating high correlation).⁶⁰ Two pairs –education level and yearly income and anxiety and depression disorders – showed high correlations. We selected income level as it had fewer missing data than education. We also transformed the anxiety and depression variables to a new variable (1 = depression and/or anxiety) to represent mood disorder. Sensitivity analysis was conducted to measure the association between the scores of LiSat domains as continuous variables and the binary outcomes from the logistic regressions (see [supplementary document](#)).

Results

The postal survey was completed by 6611 older adults (response rate of 66.1%) of which 2790 (about 42%) reported chronic pain. Detailed information about the socio-demographics, lifestyle behaviors, and comorbidities for the whole sample population and respondents without chronic pain are described elsewhere.^{33–35}

For the respondents with chronic pain (*n* = 2790), mean age was 76.2 (SD 7.4) and the majority were women (61.1%) and currently married (55.8%). About 20% had college/university education (Table 1). The yearly income levels were evenly divided with approximately 33% in each of the three categories. Less than one-tenth smoked (8.1%) and 4.8% had high alcohol consumption. In total, more than three out of four respondents were either normal weight (40.6%) or overweight (36.5%) (Table 1). The most common comorbidities were cardiovascular diseases (53.9%)

Table I Demographic and Other Variables in Relation to Life Satisfaction (LiSat-Life) in the Older Adults with Chronic Pain (N = 2790). Furthest to the Right are the Correlations of Three LiSat-II Domains with Continuous and Ordinal Variables

	All N = 2790	LiSat-Life (Valid N=2747)			LiSat-Life	LiSat-Somhealth	LiSat-Psychhealth
		Satisfied (n=1440)	Dissatisfied (n=1307)	P-value	Spearman's Rho	Spearman's Rho	Spearman's Rho
LiSat-Life, Median (IQR)	5 (4–5)	5 (5–5)	4 (3–4)	–	–	–	–
LiSat-somhealth, median (IQR)	4 (3–4)	4 (4–5)	3 (2–4)	<0.001	0.549 ^a	–	–
Satisfied	630 (22.6)	557 (38.9)	71 (5.5)	<0.001	–	–	–
Dissatisfied	2118 (75.9)	875 (61.1)	1228 (94.5)		–	–	–
LiSat-psychhealth, median (IQR)	5 (4–5)	5 (5–6)	5 (4–5)	<0.001	0.581 ^a	0.421 ^a	–
Satisfied	1872 (67.1)	1268 (88.7)	596 (46.3)	<0.001	–	–	–
Dissatisfied	862 (31.5)	162 (11.3)	692 (53.7)		–	–	–
Age, years, mean \pm SD	76.2 \pm 7.4	74.6 \pm 7.0	77.9 \pm 7.5	<0.001	–0.235 ^a	–0.199 ^a	–0.16 ^a
65–74	1246 (44.7)	789 (54.8)	449 (34.4)	<0.001	–0.232 ^a	–0.186 ^a	–0.151 ^a
75–84	1124 (40.3)	510 (35.4)	591 (45.2)		–	–	–
85+	420 (15.1)	141 (9.8)	267 (20.4)		–	–	–
Sex, women	1705 (61.1)	870 (60.4)	811 (62.1)	0.38	–	–	–
Currently married	1557 (55.8)	933 (64.8)	603 (46.1)	<0.001	–	–	–
Origin of country					–	–	–
Northern Europe	2575 (92.3)	1374 (95.4)	1243 (95.1)	0.699	–	–	–
Outside Northern Europe	22 (0.8)	66 (4.6)	64 (4.9)		–	–	–
Highest education level (n=2701)				<0.001	0.168 ^a	0.102 ^a	0.118 ^a
Compulsory school	1488 (53.3)	682 (48.9)	780 (61.6)		–	–	–
Upper secondary school	682 (24.4)	370 (26.5)	306 (24.2)		–	–	–
College/University	531 (19)	344 (24.6)	180 (14.2)		–	–	–
Income (SEK per year)				<0.001	0.189 ^a	0.183 ^a	0.201 ^a
<150 000	946 (33.9)	407 (28.3)	519 (39.7)		–	–	–
150 001– 220 000	969 (34.7)	465 (32.3)	490 (37.5)		–	–	–
>220 000	875 (31.4)	568 (39.4)	298 (22.8)		–	–	–
Smoking (n=2673)				<0.001	–	–	–
Never smoker	1406 (50.4)	740 (53.4)	648 (51.8)		–	–	–
Ex-smoker	1041 (37.3)	556 (40.1)	470 (37.6)		–	–	–
Current smoker	226 (8.1)	89 (6.4)	133 (10.6)		–	–	–
High alcohol consumption	133 (4.8)	63 (4.4)	69 (5.3)	0.268	–	–	–
BMI (n=2633)	26.3 \pm 4.7	26.3 \pm 4.8	26.3 \pm 4.8	0.545	0.016	0.08 ^a	0.031
Underweight	53 (1.9)	20 (1.5)	33 (2.7)	0.001	0.002	0.08 ^a	0.029
Normal weight	1134 (40.6)	549 (40.2)	516 (41.9)		–	–	–
Overweight	1017 (36.5)	569 (41.7)	432 (35.1)		–	–	–
Obesity	482 (17.3)	228 (16.7)	251 (20.4)		–	–	–
Social support, trustable friends (n=2687)				<0.001	0.175 ^a	0.113 ^a	0.161 ^a
No friend	110 (3.9)	32 (2.3)	76 (6.0)		–	–	–
1–2 friends	715 (25.6)	310 (21.9)	389 (30.6)		–	–	–
3–5 friends	965 (34.6)	512 (36.2)	447 (35.1)		–	–	–
> 5 friends	936 (33.5)	560 (39.6)	361 (28.4)		–	–	–

(Continued)

Table 1 (Continued).

	All N = 2790	LiSat-Life (Valid N=2747)			LiSat-Life	LiSat-Somhealth	LiSat-Psychhealth
		Satisfied (n=1440)	Dissatisfied (n=1307)	P-value	Spearman's Rho	Spearman's Rho	Spearman's Rho
Pain intensity (NRS-7d, n=2604), mean \pm SD	5.0 \pm 2.0	4.7 \pm 2.0	5.3 \pm 2.0	<0.001	-0.191 ^a	-0.369 ^a	-0.175 ^a
No/mild pain (NRS 0–3)	661 (23.7)	416 (30.5)	236 (19.7)	<0.001	-0.182 ^a	-0.347 ^a	-0.173 ^a
Moderate pain (NRS 4–6)	1318 (47.2)	687 (50.3)	612 (51)	–	–	–	–
Severe pain (NRS 7–10)	625 (22.4)	262 (19.2)	353 (29.4)	–	–	–	–
Pain spreading (APS, median (IQR))	3 (1–5)	3 (1–4)	3 (2–6)	<0.001	-0.128 ^a	-0.234 ^a	-0.08 ^a
Sleep disorders (n=2692)	1340 (48.0)	584 (41.8)	736 (58.6)	<0.001	–	–	–
General activity level (MPI- Leisure, n=2725), mean \pm SD	2.3 \pm 1.1	2.6 \pm 1.0	2.1 \pm 1.1	<0.001	0.274 ^a	0.214 ^a	0.235 ^a

Notes: Data were presented as number with percentage in parentheses, unless otherwise indicated. Student's independent *t* test and Mann–Whitney *U*-test were used for the continuous variables and Chi-square tests were used for categorical data. Correlations of three Life Satisfaction Questionnaire (LiSat-11) domains with continuous and ordinal variables, ^a*P* < 0.01.

Abbreviations: SEK, Swedish Crowns; BMI, Body Mass Index; NRS, Numerical Rating Scale; APS, number of anatomic pain sites; MPI, Multidimensional Pain Inventory.

and rheumatic disorders (44.4%). Some of the demographic characteristics in this study sample (*n* = 2790) are also described elsewhere.^{52,61}

Life Satisfaction

A total of 6510 respondents provided data on life satisfaction. The median scores of LiSat-life, LiSat-somhealth, and LiSat-psychhealth were 5 (IQR 4 to 5), 4 (IQR 4 to 5), and 5 (IQR 5 to 6), respectively, indicating rather satisfying to satisfying. The respondents with chronic pain (*n* = 2747) rated lower satisfaction than those without chronic pain (*n* = 3763) in all three domains (*P* < 0.001, ES between 0.14 and 0.38), with the largest difference for LiSat-somhealth (medium ES *r* = 0.38) and smallest for LiSat-psychhealth (ES *r* = 0.14). All ES remained in the same ranges with age and gender stratification. As shown in Figure 1, significantly lower proportions of the respondents with chronic pain scored “satisfied” (scores 5–6) in the three items, especially somatic health which had the lowest percentage (22.9%). Furthermore, among the respondents with chronic pain, those satisfied with overall life were also more likely to be satisfied with somatic health (557/1432, 38.9%, *P* < 0.001) and psychological health (1268/1430, 88.7%, *P* < 0.001) than respondents with dissatisfied life (Table 1). No ceiling or floor effects of the three LiSat-11 domains were identified, with 0.7–2.2% scoring the lowest level and up to 28.6% scoring the highest level.

Respondents with Chronic Pain: Demographics, Pain Aspects, and Comorbidities

Table 1 gives the background characteristics with comparisons between respondents satisfied (scores 5–6) and dissatisfied with life (scores 1–4) according to LiSat-life among the respondents with chronic pain. The respondents with the following characteristics were more likely to be satisfied with life: being younger, married, higher education, higher income, never smoking, overweight, and many trusted friends (Table 1).

In comparison with those dissatisfied with life (LiSat-life, scores 1–4), the respondents with overall life satisfaction (LiSat-life, scores 5–6) had lower mean values of pain intensity (mean 4.7, SD 2.0, *P* < 0.001) and pain spreading (total number of APS, median 3, IQR 1 to 4, *P* < 0.001) as well as higher mean values of general activity level (mean 2.6, SD 1.0, *P* < 0.001). Almost one-third of those with dissatisfied life had severe pain (353/1201, 29.4%, *P* < 0.001) and more than one half had sleep disorders (736/1256, 58.6%, *P* < 0.001). The significant but weak correlations of LiSat-life estimates (scores 1–6) with pain intensity, pain spreading and activity level are shown in Table 1 (Spearman's rho = 0.128–0.274). In comparison, the strongest correlation was found between pain intensity and satisfaction on somatic health (LiSat-somhealth, Spearman's rho = 0.369).

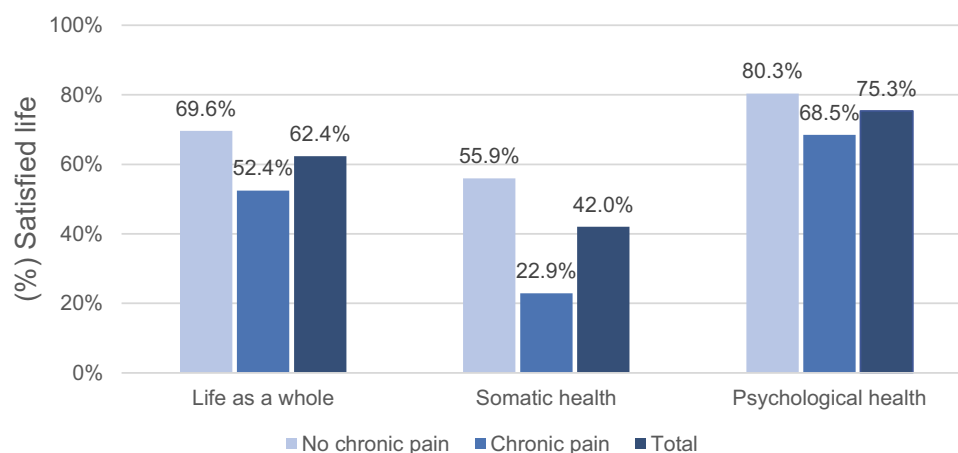


Figure 1 Proportion responding with “satisfied life” (i.e., scores 5–6) measured by LiSat-11.

Notes: Respondents without chronic pain: LiSat-life valid N=3374, LiSat-somhealth N=3380, LiSat-psychhealth N=3369. Respondents with chronic pain: LiSat-life valid N=2747, LiSat-somhealth N=2748, LiSat-psychhealth N=2734.

Figure 2 shows the distribution of comorbidities among the respondents with respect to life satisfaction on life as a whole (LiSat-life), somatic health (LiSat-somhealth), and psychological health (LiSat-psychhealth). Overall, each comorbidity was significantly associated with one or more aspects of life satisfaction. Some comorbidities, including cardiovascular diseases, depressive disorders, anxiety disorders, gastrointestinal diseases, CNS disorders, urogenital disorders, and tumor/cancer diseases showed significant associations with all three aspects of life satisfaction. We found that respondents were more likely to be dissatisfied with somatic health if they were diagnosed with diseases ($P < 0.001$), but this was not always the case for dissatisfaction with life as a whole or psychological health.

Factors Associated with Life Satisfaction

Logistic regression was used to analyze factors associated with life satisfaction among the respondents with chronic pain (Table 2). As shown in Table 2, oldest age (85+ years old, OR 0.41–0.57), currently smoking (OR 0.51–0.56), severe pain (OR 0.29–0.59), pain spreading (OR 0.87–0.95) and sleep disorders (OR 0.53–0.70) were inversely associated with life satisfaction on all three domains investigated – i.e., LiSat-life, LiSat-somhealth, and LiSat-psychhealth. Highest yearly income (OR 1.81–1.97) and increased activity level (OR 1.33–1.44) were positively related to satisfaction on all the three domains.

Some variables were associated with one or two domains of life satisfaction. For example, being a woman

(OR 1.55, 95% CI 1.23–1.94) and currently married (OR 2.0, 95% CI 1.64–2.43) increased the possibility to be satisfied with overall life. Being a woman (OR 1.36, 95% CI 1.05–1.76) also slightly increased likelihood to be satisfied with somatic health. Moreover, born outside Europe (OR 0.55, 95% CI 0.34–0.87) predicted being dissatisfied with psychological health. High alcohol consumption (OR 0.60–0.64) was negatively associated with overall life satisfaction as well as psychological health satisfaction, while being obese (OR 0.64, 95% CI 0.45–0.92) was associated with being less likely to be satisfied with somatic health. Having more than five trusted friends (OR 1.76, 95% CI 1.05–2.97) predicted satisfaction with psychological health.

Several comorbidities were negatively associated with life satisfaction, especially with somatic health satisfaction. As summarized in Table 2, eight comorbidities were inversely associated with satisfied somatic health, and four of these also indicated negative impacts on some other domains. For example, having a diagnosis of tumor or cancer affected satisfaction with overall life (OR 0.62, 95% CI 0.44–0.88) as well as somatic health (OR 0.42, 95% CI 0.24–0.74). Suffering from mood disorders (anxiety or depression) not only had a robust effect on psychological health dissatisfaction (OR 0.1, 95% CI 0.06–0.14) but also contributed to dissatisfaction with overall life (OR 0.54, 95% CI 0.38–0.78) as well. Only one comorbidity – having history of trauma injuries (OR 1.46, 95% CI 1.03–2.08) – showed weak but significant association to satisfaction with psychological health. When

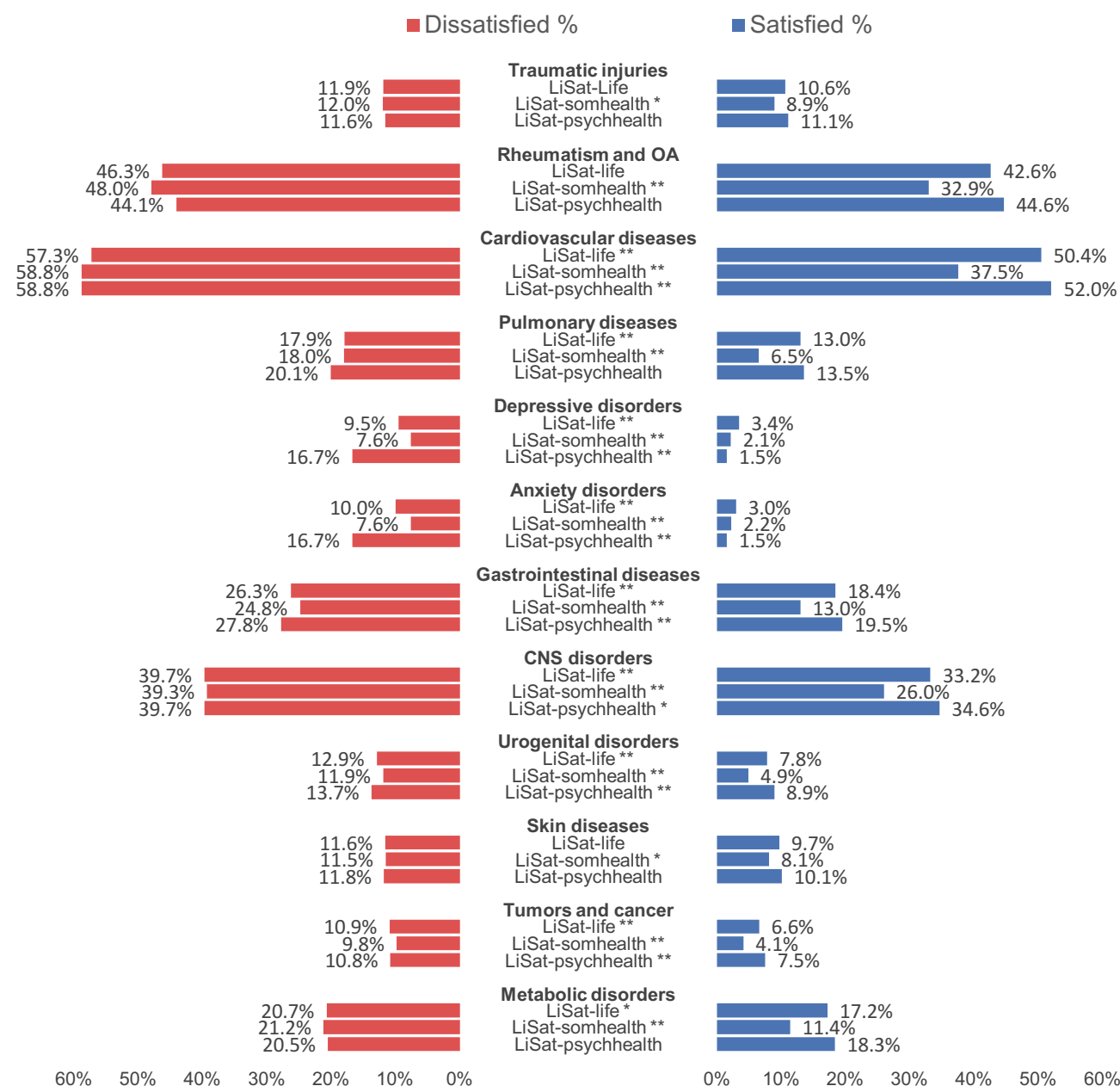


Figure 2 Distribution of life satisfaction among the respondents with chronic pain and comorbidities.

Notes: The X-axis represents the proportion of respondents with each comorbidity and reported satisfied/dissatisfied based on the three LiSat-III domains; Chi-square test, * $P < 0.05$, ** $P < 0.01$.

trauma and pain severity interactions were regressed, no significant association was evident with their interaction effect (data not shown).

Discussion

This large-scale cross-sectional study, embedded within the epidemiological survey on chronic pain prevalence and consequences (PainS65+), investigated life satisfaction in the older adults with chronic pain. Compared to

clinical patient populations, one strength of this study is the random sampling and age strata methodology implemented in the survey (sampling weights regarding age strata, sex, and city were calculated by SCB), so we could examine a wide age range with old-old and oldest-old ages included. We provided a distinctive profile of the associated factors of satisfaction on overall life (LiSat-life), somatic health (LiSat-somhealth), and psychological health (LiSat-psychhealth) regarding sociode-

Table 2 Logistic Regression Analysis of Factors Predicting Life Satisfaction in the Older Adults with Chronic Pain

	LiSat-Life Wald; OR (95% CI)	LiSat-Somhealth Wald; OR (95% CI)	LiSat-Psychhealth Wald; OR (95% CI)
Age (Ref= Youngest Group)			
75–84 years	20.92; 0.61 (0.50–0.76) ^c	4.38; 0.77 (0.60–0.98) ^a	4.65; 0.77 (0.61–0.98) ^a
85+ years	20.04; 0.49 (0.36–0.67) ^c	15.42; 0.41 (0.26–0.64) ^c	11.45; 0.57 (0.41–0.79) ^c
Sex, women (I=yes)	14.02; 1.55 (1.23–1.94) ^c	5.29; 1.36 (1.05–1.76) ^a	EXCL
Currently married (I=yes)	47.55; 2.0 (1.64–2.43) ^c	EXCL	EXCL
Born outside Europe (I=yes)	EXCL	EXCL	6.57; 0.55 (0.34–0.87) ^a
Income Level (Ref= Lowest Level)			
150 001– 220 000 SEK	3.99; 1.28 (1.01–1.63) ^a	0.38; 1.10 (0.81–1.50) ^d	2.95; 1.24 (0.97–1.59) ^d
>220 000 SEK	24.66; 1.97 (1.51–2.57) ^c	13.57; 1.81 (1.32–2.49) ^c	17.68; 1.81 (1.37–2.39) ^c
Smoking (Ref=Never Smoker)			
Ex-smoker	0.01; 1.01 (0.82–1.24) ^d	0.63; 1.10 (0.87–1.40) ^d	0.80; 0.90 (0.72–1.13) ^d
Current smoker	13.42; 0.52 (0.37–0.74) ^c	6.56; 0.56 (0.36–0.87) ^a	12.53; 0.51 (0.36–0.74) ^b
High alcohol consumption (I=yes)			
	4.31; 0.64 (0.43–0.98) ^a	EXCL	5.17; 0.60 (0.38–0.93) ^a
BMI (Ref= Normal Weight)			
Underweight	EXCL	3.00; 0.33 (0.09–1.16) ^d	EXCL
Overweight	-	0.32; 1.06 (0.83–1.36) ^d	-
Obesity	-	5.98; 0.64 (0.45–0.92) ^a	-
Social support (Ref= No Friend)			
1–2 friends	EXCL	EXCL	0.45; 1.19 (0.71–1.98) ^d
3–5 friends	-	-	3.39; 1.61 (0.97–2.69) ^d
> 5 friends	-	-	4.54; 1.76 (1.05–2.97) ^a
Pain Intensity (Ref= No/Mild Pain)			
Moderate pain	8.53; 0.71 (0.57–0.89) ^b	24.54; 0.54 (0.42–0.69) ^c	11.45; 0.62 (0.48–0.82) ^c
Severe pain	14.19; 0.59 (0.45–0.78) ^c	45.54; 0.29 (0.20–0.42) ^c	20.65; 0.49 (0.36–0.66) ^c
Pain spreading (APS)	27.47; 0.92 (0.89–0.95) ^c	29.16; 0.87 (0.83–0.92) ^c	8.59; 0.95 (0.92–0.98) ^b
Sleep disorders (I=yes)	42.14; 0.53 (0.44–0.65) ^c	9.17; 0.70 (0.56–0.88) ^b	26.22; 0.58 (0.47–0.71) ^c
General activity level (MPI-Leisure index)	59.90; 1.44 (1.32–1.58) ^c	23.89; 1.33 (1.19–1.48) ^c	33.13; 1.36 (1.23–1.52) ^c
Comorbidities (I=Yes)			
Traumatic accident/injuries	EXCL	EXCL	4.40; 1.46 (1.03–2.08) ^a
Rheumatoid arthritis and osteoarthritis	EXCL	17.62; 0.61 (0.48–0.76) ^c	EXCL
Cardiovascular diseases	EXCL	31.52; 0.52 (0.41–0.65) ^c	EXCL
Pulmonary diseases	EXCL	13.33; 0.47 (0.31–0.70) ^c	6.51; 0.70 (0.53–0.92) ^b
Anxiety or Depression disorders	10.87; 0.54 (0.38–0.78) ^c	EXCL	126.17; 0.10 (0.06–0.14) ^c
Gastrointestinal diseases	EXCL	6.89; 0.66 (0.48–0.90) ^b	EXCL
CNS disorders	EXCL	7.01; 0.71 (0.56–0.92) ^b	EXCL
Urogenital disorders	4.54; 0.71 (0.52–0.97) ^a	6.62; 0.54 (0.34–0.87) ^a	EXCL
Tumours and cancer	7.02; 0.62 (0.44–0.88) ^b	9.06; 0.42 (0.24–0.74) ^b	EXCL
Metabolic disorders	EXCL	4.35; 0.70 (0.51–0.98) ^a	EXCL
Nagelkerke R ²	0.25	0.30	0.27

Notes: ^a $P < 0.05$, ^b $P < 0.01$, ^c $P < 0.001$, ^dNon-significant, EXCL: excluded from the model with Likelihood (LR) selection; Hosmer and Lemeshow Test in all the models, $P > 0.05$. Factor without significant influence in all the models: skin disease.

Abbreviations: OR, odds ratio; CI, confidence interval. SEK, Swedish crowns; BMI: body mass index; APS index, number of anatomic pain sites; MPI, Multidimensional Pain Inventory; LiSat, Life Satisfaction Questionnaire.

mographic characteristics, lifestyles, pain aspects, and their consequences as well as comorbidities. Our results indicate that pain management and rehabilitation in

older adults might need to give more attention to comorbidities and severe pain in order to reach better life satisfaction.

Life Satisfaction in the Older Adults with and Without Chronic Pain

Using LiSat-11, previous clinical studies have reported that patients with chronic pain have low life satisfaction^{4,7,10} and the prevalence of dissatisfied persons among these patients were much higher than in the general population.⁴ This difference was much smaller in the aged general population. One of the most influential factors affecting life satisfaction for elderly people is wisdom, which is defined as having “expert knowledge in the fundamental pragmatics of life”, the tendency towards reflection on one’s own behavior and that of others, and exhibiting kindness and empathy rather than egotism.⁶² In our study, respondents with chronic pain rated lower life satisfaction than those without chronic pain, but the effect size was only small (LiSat-life and LiSat-psychhealth) to medium (LiSat-somhealth domain). The different ranges remained the same when we stratified by age and gender. In line with other studies, older adults were generally satisfied or rather satisfied with their life.^{22,27,29,30} Although previous research suggests older adults with chronic painful conditions rated their physical health lower,^{14,63,64} we only found medium effect size in satisfaction with somatic health (LiSat-somhealth), possibly due to more comorbidities.^{21,32,65} It should be noted that our sample was randomly selected from an aged population sample, including older adults in sheltered accommodations, but not specifically from nursing homes where residents report low life satisfaction levels.⁶⁶

Factors Associated with Life Satisfaction in the Older Adults with Chronic Pain

Few studies have illustrated factors associated with life satisfaction in aging populations with chronic pain. Our study focused on several aspects. Similar to general aging populations,^{12,22} some socio-demographic characteristics such as advancing ages, being a woman, married status, and high-income level (as well as high education) were related to overall life satisfaction. Among the younger patients with chronic pain, these factors did not show significant effects.^{4,7} Notably, in prior studies, subjects with pain who were born outside northern Europe reported lower life satisfaction in both general populations as well as in young patient samples with chronic pain.^{4,8} In comparison, our study showed the country of origin for older adults with chronic pain

did not significantly affect their overall life satisfaction or satisfaction with somatic health. The only borderline significance was found in relation to psychological health (regression model in LiSat-psychhealth). One reasonable speculation is that the difference between first-generation immigrants and those born in Sweden is much smaller in later life because of the integration and more similar life conditions those born in Sweden experience by the time they reach old age.

This study also considered the roles of lifestyle behaviors in association with the three domains of life satisfaction, since lifestyle behaviors are closely related to chronic pain^{67–70} as well as well-being.^{12,23} Behavioral factors are often treated as modifiable factors that suggest potentials for intervention in pain management. We found that smoking behavior negatively affected satisfaction on all three domains of the LiSat-11, while obesity showed a marginally negative impact on satisfaction with somatic health and high alcohol consumption contributed modestly to satisfaction with overall life and psychological health. In summary, these results gave insight into non-optimal lifestyles together with chronic pain that favor older adults’ dissatisfaction with their lives. Our analysis, unfortunately, did not include physical activity due to the relatively high number of missing cases. However, MPI-leisure index to some extent reflects the importance of being active in everyday life for high life satisfaction despite chronic pain.

We found that pain intensity and pain spreading influenced older adults’ life satisfaction in all three domains of the LiSat-11. The high pain intensity (NRS 7–10, severe pain) showed largest negative effects on satisfaction with somatic health, which was also found in other studies.^{4,71} Associations between pain intensity and overall life satisfaction have not been consistent in clinical studies.^{4,7,71–73} Some studies found no correlation on psychological health.^{4,7} Unlike our study, these studies did not always consider the pain distribution or pain spreading. Pain spreading, however, showed weaker effect than pain intensity in this study sample. One study measured pain distribution by estimating the percentage of the body surface. Modest correlation between pain spreading and LiSat-life (Spearman’s rho -0.194) was reported, but no significant association was found in multiple regression analysis.⁷³ One explanation is that multiple pain sites, instead of being calculated as an index or percentage, need to be presented as grades such as local, regional, and widespread

pain, which our previous studies found to be robustly associated with decreased quality of life and health.^{35,43} The effects might be more pronounced when larger dispensation of pain spreading is compared with single site pain. Together with the pain aspects, sleep disorders consistently affected life satisfaction negatively. This result ties well with previous studies wherein found connections of chronic pain and sleep disorders as well as other comorbidities (i.e. anxiety and depression).^{52,74} Therapy for sleep disorders deserves to be part of chronic pain management for older adults. In pain management, non-pharmacologic interventions need to be included, because it is a great challenge to pharmacologic treatment considering age-related physiological changes and drug interactions. For example, mind-body program showed clinically significant (30%) reduction in severe pain intensity,⁷⁵ as well as better sleep, improved quality of life and enhanced well-being.⁷⁶ In recent years, pain neuroscience education has also been used in the older adults to improve fear of movement and mobility management.⁷⁷

As reported by other researchers, comorbidity and multimorbidity affect older adults' life satisfaction negatively.^{21,32,65,78} It is not surprising that individuals might be more likely to be dissatisfied with somatic health when they have several comorbidities as was investigated in this study. The noteworthy findings are the identified comorbidities associated with the LiSat-11 domains, findings not reported in other studies.^{22,32} For example, the most common comorbidities (rheumatoid arthritis, osteoarthritis, and cardiovascular diseases) were only associated with somatic health satisfaction. Mental diseases such as depression or anxiety affected overall life satisfaction as well psychological health. Although this cross-sectional analysis could not identify whether the associations preceded or followed disease onset, our results provide an insight into the impact of chronicity on different aspects of well-being. Suffering from chronic pain leads to more health service consumption and physician contacts,^{33,43} which in turn may increase the possibility of having more medical diagnoses. Alternatively, receiving a lot of health services that address chronic illness per se might negatively influence dissatisfaction with somatic health for the elderly. Future research is needed to investigate how causality and the severity of chronic illness should be considered when estimating life satisfaction among the older adults with chronic pain, since negative effects may coexist and affect each other.

Same and Different Factors Associated with Different Domains of Life Satisfaction

Some factors are associated with all three domains of life satisfaction, including age, income level, smoking behaviors, pain aspects, sleep problems and general activity levels. Comorbidities, on the other hand, showed distinctions between the three domains. None of the comorbidities investigated here contributed to all the three domains of life satisfaction. Most comorbidities affected satisfaction with somatic health, but some comorbidities affected other domains. We might hypothesize that this difference is due to the combined effects of comorbidities as well as chronic pain and old age on individuals' life satisfaction. It is also possible that pain increases as the comorbidities increase with age.²² When we stratified by chronic pain without any comorbidity ($n = 284$, data not shown), pain aspects were still robust negative effects on two domains (LiSat-somhealth and LiSat-psychhealth) and old age was only inversely related to LiSat-life. Alternatively, we could denote multimorbidity as a variable based on the definition of two or more comorbidities.⁷⁹ In the regression models (data not shown), multimorbidity, pain aspects, and old age were significantly associated with all three domains of life satisfaction. One disadvantage of this approach is that we could not specify the impacts of different comorbidities.

Of all the investigated comorbidities, only one had a positive impact; the others showed negative effects. Having a history of trauma injuries was found to have a weakly positive effect on psychological health satisfaction. We further explored the interactions of trauma history and pain severity as well as trauma history and depression/anxiety in the models. The positive significance remained in the regression model. In those studies with younger patients, trauma history was negatively associated with satisfaction and the pain consequences of trauma was known to decrease life satisfaction.^{7,80} We speculate that older pain patients have better-coping strategies and life control, which also was reported by Wittink et al, in comparison to younger pain patients.¹⁴ However, this significance was not robust, and we had a large-scale sample. Further study with attention to psychological symptoms related to trauma experience in younger lives and life satisfaction in old age might provide more knowledge about pain management.

Naturally, it is reasonable to expect somatic comorbidities had negative effects on satisfaction of somatic health, as these diagnoses, are related to physical illness.^{65,78} The painful comorbidities (i.e., rheumatic diseases and osteoarthritis) and comorbidities substantially affecting daily activities (i.e., advanced heart disease and chronic obstructive pulmonary disease) had stronger impacts than other comorbidities, perhaps because they worsen functional limitations as well as chronic pain. Only one somatic comorbidity (pulmonary disease) was negatively associated with satisfaction on psychological health. This observation may indicate respiratory symptoms (i.e. cough, dyspnea), as well as pain, are unpleasant sensations with both physiological and psychological consequences.^{81,82} In comparison with many other chronic diseases, the rates of coexisted anxiety and depression may be more prevalent among patients with chronic obstructive pulmonary disease.⁸³ There appears to strengthen the negative effect on satisfaction of psychological health. Depression or anxiety, together with another two somatic comorbidities (urogenital disorders, tumors and cancer) negatively affected overall life satisfaction. Other studies with general aging populations have also reported similar comorbidities (urinary incontinence, prostate problems and malignancy) relating to low life satisfaction.^{15,21,32} However, our findings are based on the older adults with chronic pain. A possible explanation is the potential cause–effect relationship to other factors, such as pain aspects and sleep disorders.

Study Limitations

Several limitations deserve consideration. First, as mentioned above, our cross-sectional analysis cannot draw any conclusion of causality or provide information on the life satisfaction affected by these associated factors over time. Second, the survey had a population-based study design, so it did not cover all in-depth information on the time of comorbidity diagnosis, severity, and progression of chronicity. However, we chose to use the clinical diagnosis rather than only subjective opinions even if this measurement could have missed some undiagnosed conditions. Our trust in medical diagnosis as a reliable information source aimed to capture the comorbidities that received attention from both individuals (to seek health service) and health professionals (to document the medical records). We might have underestimated the burden of self-perceived illness. Third, the information about older adults' experience of isolation, loneliness, and activity limitation was not

adequately collected compared with other studies.^{21,29,30} We did not analyze these common geriatric and aging challenges deeply in relation to chronic pain and life satisfaction. Nevertheless, some variables, such as marital status, number of trusted friends, and the MPI-leisure index, described to some extent a profile of support from others, social relationships, and activity levels. We are aware that life satisfaction is affected by multifaceted factors and older adults with chronic pain should not be treated as homogenous or a medical entity. The interactions of the aging process, social roles, as well as medical conditions together with chronic pain need to be addressed in pain research.

Conclusion

In this large-scaled population-based study, older adults were generally satisfied or rather satisfied with their lives. Those with chronic pain reported lower life satisfaction, but the difference among chronic pain patients is trivial, except for satisfaction on somatic health. Severe pain had robust negative impacts on all three domains of life satisfaction. Certain lifestyles and several comorbidities significantly affected different domains of life satisfaction. Promoting lifestyle behavior change in patients with chronic pain might lead to being more satisfied with life in old age. To help patients obtain higher life satisfaction, pain management (including non-pharmacological interventions) needs to raise concerns about comorbidities and severe pain.

Ethical Approvals

The study was approved by the Regional Ethics Research Committee in Linköping, Sweden (Dnr: 2012/154-31). Completion of the postal survey was deemed to be agreement of patient informed consent. This study was conducted in accordance with the Declaration of Helsinki.

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Disclosure

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