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Gender perspectives on pain among older adults

Findings from the Swedish National Study on Aging and Care (SNAC) – Blekinge

LENA SANDIN WRANKER | FACULTY OF MEDICINE | LUND UNIVERSITY



Gender perspectives on pain among older adults

Findings from the Swedish National Study
on Aging and Care (SNAC) – Blekinge

Lena Sandin Wranker



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Gender perspectives on pain among older adults - Findings from the Swedish National Study on Aging and Care (SNAC) - Blekinge		
Abstract		
<p>Background and aims: Pain is a multidimensional, unpleasant sensory and emotional experience. Although common in older adults, its relationship with ageing is unclear. The aim of this thesis was to investigate the prevalence of pain from a gender perspective, from which part(-s) of the body the pain emanated, the estimated intensity of the pain and what treatment was given to alleviate it (study I), the influence of biological, social, psychological and existential factors on the relationship between pain and quality of life (study II), possible associations between pain and personality traits (study III), and changes in pain over time measured in a population-based sample followed for a nine-year period (study IV).</p> <p>Methods: The studies employed data from the baseline investigation (2001-2003) of the longitudinal Swedish National Study on Aging and Care – Blekinge (SNAC-B). Trained assessors carried out medical examination and testing on two occasions, each examination lasting for about 3 hours. A total of 1,402 randomly selected individuals in different age cohorts from the older population were included. The inclusion criteria for study IV were older adults aged seventy-two years and over at the baseline investigation, who were also examined at the nine-year follow up. The study protocols at both examinations were identical.</p> <p>Results: Almost 55% of the participants reported pain, predominantly women, $p < 0.01$. In the majority of cases the intensity was rated as moderate or severe (VAS >4) and women scored higher than men, $p < 0.023$. Pain intensity declined with age among men, $p < 0.013$. Use of prescribed pain killers was reported by 283/478 (59.2%) women, compared to 128/263 (48.7%) men, $p < 0.01$. A total of 128/263 (48.7%) of the men received no treatment whatsoever for their pain (Study I). The strongest OR for low QoL among elderly women was found for pain (OR 2.27, CI 1.36-3.78), which is in contrast to elderly men who suffered from insomnia (OR 1.86, CI 1.04-3.33). The results indicate gender differences in how pain influences quality of life (Study II). Personality traits and pain were related among the older adults but gender differences were observed. The relationship between pain and neuroticism in women was about the same as the relationship between pain and neuroticism/openness in men (Study III). The prevalence of pain declines with increasing age (81 years and older), but is still higher among women. The pain relief rate is higher for older men compared to older women. Low external locus of control scores may contribute to pain relief among men (Study IV).</p> <p>Conclusions: Pain is common in the aging population, especially among women, but declines with increasing age and the intensity also decreases among men. There are gender differences in how pain influences quality of life. It is possible for both elderly women and men to obtain relief from pain. Low external locus of control scores may contribute to pain relief among men.</p>		
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*AND IN THE END
IT'S NOT THE YEARS IN YOUR LIFE THAT COUNT
IT'S THE LIFE IN YOUR YEARS.*

ABRAHAM LINCOLN

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Abstract

Background and aims

Pain is a multidimensional, unpleasant sensory and emotional experience. Although common in older adults, its relationship with ageing is unclear. The aim of this thesis was to investigate the prevalence of pain from a gender perspective, from which part(s) of the body the pain emanated, its estimated intensity and what treatment was given to alleviate it (study I), the influence of biological, social, psychological and existential factors on the relationship between pain and quality of life (study II), possible associations between pain and personality traits (study III), and changes in pain over time measured in a population-based sample followed for a nine-year period (study IV).

Methods

The studies employed data from the baseline investigation (2001-2003) of the longitudinal Swedish National Study on Aging and Care – Blekinge (SNAC-B). Trained assessors carried out medical examination and testing on two occasions, each lasting for about 3 hours. A total of 1,402 randomly selected individuals in different age cohorts from the older population were included. The inclusion criteria for study IV were older adults aged seventy-two years and over at the baseline investigation, who were also examined at the nine-year follow up. The study protocols at both examinations were identical.

Results

Almost 55% of the participants reported pain, predominantly women, $p < 0.01$. In the majority of cases the intensity was rated as moderate or severe (VAS > 4) and women scored higher than men $p < 0.023$. Pain intensity declined with age among men, $p < 0.013$. Use of prescribed pain killers was reported by 283/478 (59.2%) women, compared to 128/263 (48.7% men, $p < 0.01$). A total of 128/263 (48.7%) of the men received no treatment whatsoever for their pain (*Study I*). The strongest OR for low QoL among elderly women was found for pain (OR 2.27 CI 1.36-3.78), in contrast to elderly men who suffered from insomnia (OR 1.86 CI 1.04-

3.33). The results indicate gender differences in how pain influences quality of life (*Study II*). Personality traits and pain were related among the older adults but gender differences were also observed. The relationship between pain and neuroticism in women was about the same in strength as the relationship between pain and neuroticism/openness in men (*Study III*). The prevalence of pain declined with increasing age (81 years and older), but was still higher among women. The rate of pain relief was higher for elderly men compared to elderly women. Low external locus of control scores may contribute to pain relief among men (*Study IV*).

Conclusion

Pain is common in the aging population, especially among women, but declines with increasing age and the intensity decreases among men. There are gender differences in how pain influences QoL and personality traits also play a role. It is possible for both elderly women and men to obtain relief from pain. Low external locus of control scores may contribute to pain relief among men.

Abbreviations

ACT	Acceptance and commitment therapy
CBT	Cognitive-behavioural treatment
C.I.	Confidence interval
HRQoL	Health related quality of life
IASP	International Association for the Study of Pain
LLLT	Low-level laser therapy
LOC	Locus of control
MCS	Mental component summary Scale (in SF-12)
N	Neurotic
n.s.	Non-significant
O	Openness
OR	Odds Ratio
PCS	Physical component Summary Scale (in SF-12)
QoL	Quality of life
SBU	Swedish Agency for Health Technology Assessment and Assessment of Social Services. (Statens beredning för medicinsk och social utvärdering)
SF-12	Short form Health Survey – 12
SoC	Sense of coherence
VAS	Visual analogue scale

Definitions

Insomnia	A persistent difficulty initiating or maintaining sleep
Older	People aged 60 years and over
Pain	An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage
Personality traits	“The big five” personality theory can be summarized in the acronym OCEAN; Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism

Original papers

This thesis is based on the following papers, referred to in the text by Roman numerals:

- I Wranger L.S., Rennemark M., Berglund J. Pain among older adults from a gender perspective – findings from the Swedish National Study on Aging and Care (SNAC-Blekinge). *Scandinavian Journal of Public Health*, 2016;44(3): 258–263.
- II Wranger L.S., Rennemark M., Berglund J., Elmståhl S. Relationship between pain and Quality of Life - Findings from the Swedish National Study on Aging and Care - Blekinge study. *Scandinavian Journal of Pain*, 2014;5:270–275.
- III Wranger L.S., Rennemark M., Elmståhl S., Berglund J. The influence of personality traits on perception of pain in older adults - findings from the Swedish National Study on Aging and Care - Blekinge study. *Scandinavian Journal of Pain*, 2015;7:3–8.
- IV Wranger L.S., Rennemark M., Berglund J., Elmståhl S. A 9-year follow-up of women and men reporting pain: Results from the Swedish National Study on Aging and Care – Blekinge (submitted)

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Introduction

This thesis and the research behind it are a result of my work as a senior consultant in rehabilitation and a meeting with my colleague and future supervisor, Professor Johan Sanmartin Berglund, who was engaged in an ongoing multicentre study, The Swedish Study on Aging and Care (SNAC), which aimed to explore different aspects of the aging process. Professor Berglund introduced me to my other two tutors; Professor Mikael Rennemark from Linnéus University, who, with his deep knowledge of psychology, has been acting co tutor, especially regarding psychological aspects and Professor Sölve Elmståhl of Lund University, who supported this thesis as a tutor with his great expertise in the area of geriatrics. My background comprised clinical experience with special knowledge of persistent pain, but as the clinic only admitted adults aged between 18 – 65 years, my curiosity about how pain influenced older adults was awakened.

I have worked as a general practitioner for many years and as a senior consultant in rehabilitation with focus on persistent pain since 2006. During this time I found that there is no gold standard for how best to treat those who suffer from pain. The experience of pain is associated with actual or potential tissue damage or described in terms of such damage (Merskey and Bogduk, 1994). The broad definition of pain implies that it emanates from some part of the body, the body in general or the psyche. Pain is a complex individual experience, the sensation of which depends on past personal episodes, culture, context and last but not least, personality.

In the course of the last ten years researchers have contributed many findings in the area of pain. Nevertheless, there are still questions waiting to be answered before all aspects of pain are fully understood. My ambition is to make visible the impact and experience of pain among older adults, so that this thesis will constitute a contribution to the area of pain research and gender differences among older adults.

Pain among older adults and the gender aspects of factors influenced by pain require some clarification. First of all, there is a need for a definition of old. In this thesis, being old means belonging to the part of the population aged 60 years and over. As the situation of those aged 60 – 75 years differs from that of those aged 85 years and over, it is necessary to apply a differentiated view of the life span. A division into young old (60 – 74 years), old old (75 – 84 years) and very old (85

years and above) (Field & Minkler, 1988) seems appropriate, as for most people the period from retirement to death involves major transitions. In view of this fact, pain as defined by The International Association for the Study of Pain (IASP) needs to be discussed in combination with other aspects of life. The goal of healthcare providers is not only to ensure good health-related quality of life (HRQoL), but to maintain quality of life (QoL) in general because a sizeable proportion of older people live with one or more diseases (Sarvimäki & Stenbock-Hult, 2000).

Background

The problem of pain

As pain is “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”, (Merskey and Bogduk, 1994), it interacts with biological, social and emotional factors, as well as external factors from the surrounding environment. Despite the fact that many researchers have advanced our knowledge about the experience of pain, questions about prevalence of and changes in pain over time among older adults still remain unanswered. As no consistent pattern of gender differences in human pain sensitivity has been found in laboratory research, (Racine (1) 2012, Racine (2) 2012), it appears that some of these differences are partly explained by cognitive and social factors. In the present thesis, the concept of gender differences has been used to describe the factual differences between men and women.

The Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU 2006) reports a persistent pain prevalence of 40 – 65% in the Swedish population. The Study of Living Conditions in Sweden that included the younger part of the population (16-84 years) reported a prevalence of 59.5% in 2014 (Statistics Sweden 2004, updated 2015). Both men and women reported, absolutely and relatively, significantly more pain in 2002/03 than in 1988/89 (Statistics Sweden 2004, updated 2015); Table 12.15 A and 12.15 B). Among men the increase was greatest in the 80-84 year age group and among women in the 70-74 and 85-89 year age groups.

The development of the health of the elderly has been debated and three hypotheses highlighted:

- The hypothesis of compression of morbidity indicates that improved living conditions and a healthier lifestyle lead to the later onset of chronic diseases.
- The hypothesis of the expansion of morbidity claims that improved medical treatment for the elderly means that a greater proportion of people with health problems survive to higher ages. The age-related morbidity will thereby increase with more seriously ill survivors.

- The hypothesis of the postponement of disease includes the postponement of death to a greater age.

Regardless of which hypothesis is a true prediction of how aging and health will develop in the future, pain will be an important aspect of QoL in old age.

There is a dose-response relationship between pain frequency / intensity and difficulties performing activities, which underscores the importance of treating pain without necessarily eliminating its cause (Weiner et al. 2003). Medication is the traditional treatment for pain, despite the fact that it sometimes means treating in the absence of evidence pertaining to long-term use among older adults. Of the many treatment options available today, only medication has been widely accepted. Cognitive impairment and increased risk of adverse drug effects must be considered, especially when treating older adults. Research has led to noteworthy advances in our knowledge about the effects of selected interventions. For example, we know that proactive treatment of pain associated with hip fractures improves function following rehabilitation (Zabari et al. 2012), but as pointed out many years ago, there are still deficiencies in the knowledge about rehabilitation and medical interventions in the elderly (Hoenig et al. 1997).

The high prevalence of pain can be assumed to place older people at a greater risk of low QoL (Netuveli & Blane, 2008). If people are unable to satisfactorily manage the activities of daily living due to pain, the consequence might be lower goals and expectations (Fagerström et al. 2012). In older adults with and without mobility limitations, declining physical performance contributes to increased fear of falling and deterioration in QoL.

There is also a relationship between personality traits and pain perception (Albrecht et al. 2015). Different personality characteristics may influence the perception of pain severity. Extraversion was found to be a significant predictor of pain among older cancer patients, where those with high extraversion scores rated their perceived pain intensity lower. Similarly, conscientiousness and extraversion were substantial moderators of the worst pain (Krok & Baker, 2014). The personality trait of neuroticism is associated with key characteristics of pain, sleep and fatigue among fibromyalgia patients and research findings suggest that neuroticism is an important modulator of the clinical symptoms of fibromyalgia (Malin & Littlejohn, 2012). It has not been established whether personality traits affect pain and pain perception in the elderly, but if it is indeed the case, another issue is whether there are gender differences.

Pain may also be related to sleep problems although the relationship could be bidirectional (Fishbain et al. 2010). Petrov and colleagues found altered pain processing among younger adults by gender and ethnicity, which was also associated with insomnia. Personalized sleep interventions may help to relieve

pain (Petrov et al. 2015). Whether this gender difference also applies to older adults is still unknown.

Pain physiology

The central nervous system perceives *acute pain* as a threat to survival, making it a top priority. Acute pain is defined as a sudden, severe experience of pain, for which quick and effective treatment is desirable. It is almost always caused by tissue damage. The sensation of pain is partly transmitted by specific pain receptors to the spinal cord via the thalamus directly to the cortex, which is why pain is felt immediately. In parallel paths also convey information centres for autonomous control (pain stimulates tachycardia, hypertension and tachypnoea). The PAG (periaqueductal grey matter) is an inhibitory centre in the brain stem that provides descending inhibitory pain modulation pathways. Switching takes place in the thalamus to the sensory cortex (clear and localized pain perception) and limbic structures (more diffuse, dull pain experience with emotional / depressive modalities), (Werner & Leden, 2010).

Nociceptive pain is associated with tissue damage or irritation and occurs through the stimulation of nociceptors located in the skin, muscles and bones. The pain signal is passed through A-delta and C fibres to the spinal cord dorsal horn, where switching is made to the second order neuron. The spinal transmission mainly occurs via two pathways, both of which pass through the thalamus. The lateral directs signals to the cerebral cortex gyrus postcentralis responsible for the sensory-discriminative character of pain (intensity, location). The medial nerve passage gives off branches including the hypothalamus, limbic system and prefrontal cortex. The connection with the hypothalamus provides the conditions for the autonomous reactions associated with pain stimulation. Activation of structures in the limbic system is responsible for the emotional-affective components (anxiety, fear, stress) of pain, whereas activity in the anterior cortex constitutes the cognitive-evaluative components (cause-effect) (Werner & Leden, 2010).

Neuropathic pain can occur as a result of damage to the sensory nerves or the central nervous system axons can give rise to ectopic impulse formation, which can cause paresthesia, dysesthesia and pain in the nerve supply area (Werner & Leden, 2010).

Research has shown that the transfer and processing of pain signals from their origin in the nociceptors or damaged nerve fibres is a dynamic and complex process (Werner & Leden, 2010).

Various mechanisms both reinforce and suppress the signals. Tissue damage can release a large number of substances in the damaged area, such as prostaglandins, serotonin and bradykinin, which among other things give rise to an inflammatory reaction and sensitize nociceptors so that the pain perception threshold is reduced (peripheral sensitization). Persistent nociceptive stimulation causes a series of events, including the release of various neuropeptides in the spinal cord dorsal horn. The so-called N-methyl-D-aspartate (NMDA) receptors are also activated, causing an increase in calcium influx that leads to a sharp rise in the excitability of secondary neurons. Structural changes such as upregulation of resting synapses also occur. These events result in a further lowering of the pain perception threshold, increasing the perceptive field, i.e., spreading the pain beyond the primary injured area, and the occurrence of the so-called wind-up phenomenon, where repetitive nociceptive stimulation of unchanged intensity leads to a gradual increase in the pain response. The events in the spinal cord dorsal horn could be summarized under the concept of central sensitization. It is likely that changes also occur at higher levels in the central nervous system, but this requires further investigation (Werner & Leden, 2010).

Psychogenic pain arises exclusively from psychological causes, such as deep depression and some psychoses. This pain can also be described as somatoform disorders (Werner & Leden, 2010).

Idiopathic pain is a diagnosis based on exclusion. Idiopathic pain cannot be attributed to any of the above mentioned categories (Werner & Leden, 2010).

Chronic pain is defined as a painful condition that has lasted for more than three months. The central pain modulation system is affected by the mechanisms described above, which means that the wind-up and spread of pain to more areas of the body is almost always present. Chronic pain is always multifactorial and in addition to an individual's genetic predisposition, psychological and social factors play a role in pain perception (Werner & Leden, 2010).

Management of pain

At present there is no "gold standard" manual for how to best treat pain in the elderly. There are three alternative treatment tracks: pharmacological, non-pharmacological and multimodal. So far no treatment has gathered enough convincing evidence and in most cases the evidence is conflicting (Wolkerstorfer et al. 2016) Geriatricians favour multimodal treatment strategies. Pain management among older adults involves the challenge of developing coherent, effective multi-model treatment (Makris et al. 2014).

Pharmacological methods

The pharmacological process steps for cancer patients recommended by the World Health Organization are also advised for non-cancer pain (WHO, 2016).

Paracetamol (Acetaminophen) is used for pain treatment in all age groups (Schnitzer, 2006). The adverse event profile is favourable at therapeutic doses and it is often possible to combine Paracetamol with other medications. Paracetamol is recommended as the first-line medication for pain of various geneses (Nelson et al. 2014). Non-steroidal anti-inflammatory drugs (NSAIDs) are among the most prescribed drugs in the world. The new cyclo-oxygenase-2 inhibitors, for example Celecoxib, are a treatment option for mild to moderate pain in patients at risk of bleeding. When this fails to provide satisfactory pain relief a combination of non-opioid and opioid analgesics, for example codeine, might be an alternative (Schnitzer, 2006). For more severe pain, a combination of non-opioid analgesics and opioids with strong pain relief properties (e.g., morphine) may be preferable (Nikolaus & Zeyfang, 2004). The use of opioids in elderly patients with impaired hepatic and renal function must be mentioned. Impaired kidney function is common and can become more severe with age. In the case of most opioids the half-life of the active drug and metabolites is prolonged in patients with impaired renal function. A reduced dose with a longer interval between doses is therefore recommended. Creatinine clearance must be monitored. An exception is buprenorphine, which is often well tolerated and where transdermal patch treatment provides 24-hour pain relief (Pergolizzi et al. 2008).

Non-pharmacological methods

Although the focus of this thesis was not to study non-pharmacological therapies, a few examples should be mentioned:

Physical activity is important for healthy ageing, as it raises the body's self-produced morphine (endorphins) level (Janal et al. 1984). A higher endorphin level leads to reduced perception of pain (Janal et al. 1984). Nevertheless, the majority of older adults with back pain still had persistent symptoms, disability and impairment over a 12-month follow-up after training with a physiotherapist (Rundell et al. 2015).

Transcutaneous electrical nerve stimulation (TENS) is a pain treatment method based on the gate control theory of pain (Melzac and Wall, 1965). High and low frequency TENS activate different opioid receptors (Vance et al. 2014). Both applications have been shown to provide analgesia but additional research in the area of TENS tolerance is necessary (Vance et al. 2014).

In patients aged over 50 years with moderate or severe chronic knee pain, neither laser nor needle acupuncture conferred more benefit than sham treatment for pain or function (Hinman et al. 2014).

A pilot study of individuals aged ≥ 60 years found an increase in the use of all nondrug treatments and a decrease in pain-related distress and pain scores at a 2 week follow-up after a 30 minute educational session (Fouladbakhsh et al. 2011).

Combined manual therapy such as naprapathy could be considered for patients with non-specific back and/or neck pain. Younger adults reported that it led to a decrease in pain compared with advice to stay active and on how to cope with pain provided by a physician (Skillgate et al. 2010). Adverse events, i.e., soreness in muscles, increased pain and stiffness after manual therapy, are common, especially among women (Paanalahti et al. 2014).

With regard to chronic neck pain, cognitive behavioural therapy (CBT) was only found to be statistically significantly more effective for short-term pain reduction when compared to no treatment (Monticone et al. 2015). Acceptance and commitment therapy (ACT) may be an effective and appropriate treatment for chronic pain in older adults as they were more likely to respond to ACT, while younger adults were more likely to respond to CBT (Wetherell et al. 2015). Gender differences in pain responses to ACT treatment were found among fibromyalgia patients (Lami MJ., 2016).

Low Level Laser Therapy (LLLT) is a viable option in the treatment of shoulder pain arising from adhesive capsulitis of the shoulder among older adults (Ip & Fu, 2015). LLLT has also proven to be a treatment option for disco genic back pain and can be an alternative to surgery (Ip & Fu, 2015).

Multimodal pain management comprises medication, psychotherapy, exercise therapy and physiotherapy and is provided by the relevant medical professionals, including nurses.

A multimodal approach to pain is strongly recommended, although elderly individuals have a greater need for coordination of social resources than younger people. A prerequisite for successful treatment is an understanding of the patient's expectations, goals and comorbidities, as well as her/his cognitive and physical status (Makris et al. 2014). Patients with lower back pain who received multimodal pain management were likely to experience less pain and disability than those receiving usual care or physical treatment, even if the effects were of a modest magnitude (Kamper et al. 2014).

Aging and definition of old age

Sweden and Europe have an aging population. Ten years ago, Sweden's population was characterized by many young people and a smaller proportion of elderly individuals. As people live longer and have fewer children, the age structure has changed and the population pyramid now has a completely different shape. According to the population forecast by Statistics Sweden, the proportion of elderly individuals is expected to increase by 30 percent between 2010 and 2050 (Statistics Sweden, 2014). This means that a quarter of the population will be 65 years or older in 2050 and that the group of people we describe as "elderly" represents a growing proportion of our population. The population pyramid also shows a clear pattern of age distribution when women and men are compared, with more men in all age groups up to 60 years, while at older ages women are in the majority (Statistics Sweden, 2014). The reason for this is because more boys than girls are born, but women live longer than men.

No consensus exists about how to define old age. The retirement age (in Sweden about 65 years) is used in many countries as an indicator of the transition to the group classified as "elderly".

Field and Minkler used the age of 60 years to represent the transition to the elderly group. They also suggested dividing the elderly into young old (60-74 years), old-old (75-84 years) and very old (85+ years) (Field & Minkler, 1988). In this thesis, the study population has been divided into two groups (60-80 years and 81 years and older).

The Swedish National Study on Aging and Care, which started in 2001, randomly selected and included residents aged 60 years and older (Lagergren et al. 2004).

Pain among older adults

Despite increased efforts to conduct research on pain in the elderly there is still a lack of knowledge about pain in the aging population. Many reports on the prevalence associated with various diseases state that pain is common.

An investigation of a European population aged 80 years and over revealed that pain prevalence was 52.5 % but age was not associated with higher prevalence among either women or men (Gálvez-Barrón et al. 2015). On the other side of the coin there is also a critical need to better understand the relationship between aging and pain because research among younger adult pain patients (i.e., fibromyalgia) has found an increased risk of the premature development of age

related diseases, cognitive and physical decline, as well as earlier death (Hassett et al. 2015).

Factors affecting the experience of pain

Subjective age perception may be a marker of health and well-being. A study of 60-96 year olds demonstrated that those who experienced more health problems, stress or negative impact than the average felt older than their chronological age (Kotter-Grühn et al. 2015). It is not advanced age per se that may cause low QoL, but the fact that people are unable to satisfactorily manage the activities of daily living due to impaired sleep and pain, which may lower their goals and expectations (Fagerström et al. 2012). Ishizaki and colleagues found that aging was significantly associated with a small increase in good self-rated health from the age of 67 to 91 years (Ishizaki et al. 2009). These findings may be explained by lower expectations and reduced demands on mobility as we grow older. Brenowitz and colleagues revealed that deterioration in self-rated health predicts a decline in self-rated physical function, but that poor physical function cannot predict changes in self-rated health in a mutual way. (Brenowitz et al. 2014). Patients with persistent pain reported almost double the number of subjective health complaints compared to the general population (Grövlé, 2011).

Normal sleep architecture changes with age. Elderly individuals wake up earlier and most experience a decrease in total sleep duration. A change in the distribution of sleep stages also differs between women and men (Dorffner et al. 2015). Complaints about poor sleep are more common among women, which is probably due to the hormonal differences between the sexes (Mallampalli & Carter 2014). The prevalence of waking up during the night and having a hard time going back to sleep again increases significantly in older men (Verster et al. 2008). Differences in sleep behaviour and sleep disorders may not only be driven by biological factors but also by gender differences in the way women and men report symptoms (Mallampalli & Carter, 2014).

Insomnia is a persistent difficulty initiating or maintaining sleep. Sleep disturbance may be due to difficulty falling asleep, waking up early or broken sleep caused by many nocturnal awakenings. The subjective experience of sleep disorders has been reported as insomnia, regardless of the type of sleep disorder involved. A Norwegian study found that all sleep parameters, with the exception of sleep duration, were significantly associated with reduced pain tolerance among adults (Sivertsen et al. 2015). The fact that sleep deprivation causes hyperalgesia is well known. Questions still remain about how the increased pain signals in the brain after sleep deprivation lead to complex changes. Gating mechanisms are responsible for how the pain is described in subjective pain reports (Karmann et al.

2014). The effects of sleep deprivation on pain and affect can be unconnected (Karmann et al. 2014).

When the role of education and financial situation were studied among employees, both factors were found to influence subjective health (Runeson et al. 2012). Higher education provides an advantage in walking speed of up to 15 years for men and 10 years for women (Weber, 2016). Patients with a high educational level experienced less pain and achieved pain remission more often than those with a low educational level (Jiang et al. 2015). Education and financial status are affected by the social infrastructure. Higher education was unusual among the elderly in Swedish society, although most have the legally stipulated minimum education. After marriage most women stayed at home as housewives. However, these factors will change over time. New groups of older adults have secondary education and many will also have a degree from a university. Occupational and private pension insurances have become common, which means increasing differences in pensioners' standard of living.

The attribution theory is "phenomenological" (Rotter, 1966). It seeks to explain how people and their environment emerge as phenomena (perceived), i.e., what it is that makes them behave as they do. We ascribe reasons to ourselves or others for certain events and outcomes, as well as the control of what happens. The gender differences in the perception and expression of pain stem from a variety of social and psychological influences (Miller and Newton, 2006).

Rotter's Locus of Control scales started with the belief that the source of reinforcement for health-related behaviours is primarily internal, a matter of chance, or under the control of powerful others (Rotter, 1966). These scales were further developed into the Multidimensional Health Locus of Control scales by Wallston & Wallston (Wallston et al. 1978 and Wallston & Wallston, 1982). Gender differences must be taken into account when using the Multidimensional Health Locus of Control scales on older adults living with pain. Buchelew and colleagues found that among men, cluster assignment was related to age, while in women, it was related to the use of coping strategies (Buchelew et al. 1990).

Lazarus and Folkman (Folkman & Lazarus, 1986) investigated the relationship between cognitive appraisal, coping processes and their outcomes in stressful situations. Stress and coping research had a considerable influence on the psychological perception of health and well-being, which was developed by Antonovsky, the man behind the concept of Sense of Coherence (SoC). In his book Antonovsky discusses how changes in life can result in either the development or lack of a sense of coherence (Antonovsky, 2005). Health and disease are at opposite ends of a sliding scale, with high SoC predisposing a person to good health. Experiencing life as comprehensible, manageable and meaningful leads to high SoC, where stress is considered a stimulating challenge.

Individuals with a high SoC are active, healthy and have a stable network of supportive friends (Antonovsky, 2005). People with high self-esteem control their existence and have no problem contacting officials and politicians. They are active and find it easier to remain healthy (Antonovsky, 2005). Antonovsky's 29-item Sense of Coherence Scale (SOC-29) is strongly related to perceived health, especially mental health (Eriksson & Lindström, 2006). SoC is also an important predictor of pain (Wiesmann et al. 2014), and low SoC increases the risk of subjective bad health. A passive life with a fragile network and ambient signals can be interpreted as chaotic noise without regard for the individual (Antonovsky, 2005). Among patients with rheumatoid arthritis, a high SoC predicts improvement in psychological distress and health related QoL over time (Goulia et al. 2015).

In combination with our genotype, personality is the way we react to and act towards stimuli from our surroundings. Researchers have defined personality differently, depending upon the theory on which they base their research. However, all personality psychologists use the term personality to refer to psychological qualities that contribute to an individual's characteristic patterns of feeling, thinking and behaviour. Researchers believe that the personality is relatively stable over time and in different situations. Our personality is developed during childhood and adolescence. Several studies support the relative stability of personality traits across the adult human lifespan. These personality traits influence how we will interpret and manage both success and setbacks in later life and might even predict changes in health in middle age (Hampson et al. 2015). In 1884 Sir Francis Galton presented the lexical hypothesis, which represented the first taxonomy of human personality traits (Atkinson et al. 2000). This hypothesis formed the basis for the development of the Big Five personality traits theory (Goldberg, 1993).

The Big Five personality traits theory is a psychological model for describing and categorizing personalities that was developed by the American psychologists Paul T. Costa Jr. and Robert R. McCrae (Costa Jr. & McCrae, 1997). It creates a description of the human personality in terms of five basic, partly hereditary, dimensions or characteristics: neuroticism, extraversion, openness, agreeableness and conscientiousness. The Big Five personality traits can be summarized in the acronym OCEAN: (Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism).

The personality trait of openness can be described as a need for adventure, unusual ideas and different experiences. Openness is also characterized by intellectual curiosity, creativity and the ability to make new contacts. Another characteristic of openness is thinking in symbols and abstractions far removed from previous experiences.

An individual with the personality trait of conscientiousness tends to be organized and reliable. She/He has good self-discipline, acts dutifully, strives to achieve perfection and prefers planned rather than spontaneous behaviour.

The characteristics of the personality trait of extraversion are energy, positive emotions, self-confidence, sociability and a tendency to seek stimulation in the company of others.

The personality trait agreeableness means that the individual has a tendency to be compassionate, cooperative, trustworthy and helpful.

The individual with highly neurotic personality traits often experiences unpleasant emotions, such as anger, anxiety, depression and vulnerability. Neuroticism frequently implies emotional instability and low impulse control.

Chapman and colleagues have demonstrated stability in the gender differences between neuroticism and agreeableness throughout the lifespan, which should be taken into consideration in pain research in the elderly (Chapman et al. 2007). Researchers have found evidence that chronic widespread pain, anxiety, emotional instability and emotional intelligence among adult twins are influenced by different underlying latent traits sharing the same genetic but not shared environmental factors (Burri et al. 2015).

This thesis reports on pain among older adults and is aimed at better understanding aspects of aging with dignity and independence, even when living with pain. Consequently, it is of interest to not only study pain, but also personality traits, SoC, treatment, QoL and gender differences in the proportion of the aging population living with pain.

Gender

There are still shortcomings in the knowledge about gender differences in the assessment and treatment of acute and chronic pain conditions. Prior to The Academic Emergency Medicine consensus conference convened in Dallas, Texas in May 2014, experts and stakeholders from the pain research field (Museum Jr. et al. 2014) identified eight areas where gender causes differences in both pharmacological and non-pharmacological interventions for pain.

1. Gender differences in the pharmacological and non-pharmacological interventions for pain include opioid tolerance, side effects and misuse.
2. Gender differences in pain intensity perceptions.
3. Gender differences in pain outcomes.
4. Gender differences in the relationship between pain and psychological responses.

5. Gender differences in the influence of the physician-patient relationship.
6. Gender differences in the influence of acute and chronic stress on pain.
7. Gender differences in biological mechanisms and molecular pathways mediating pain.
8. Gender differences in biological mechanisms and molecular pathways mediating chronic pain development after trauma, stress, or illness exposure.

There are differences between women and men with regard to drug use (Manteuffel et al. 2014). Gender differences also exist in terms of adherence to prescribed medications and the probability of getting medicines prescribed based on drug treatment guidelines (Manteuffel et al. 2014). Among adults, adherence to prescribed medication is higher in males and elderly patients (Rolnick et al. 2013). When measuring prescription opioid adherence, 54% of individuals with chronic pain appeared non-adherent to their opiate regimen (Matteliano and Chang, 2015). Higher income, high educational level and low co-morbidity increase adherence (Rolnick et al. 2013).

The concept of quality of life (QoL)

QoL is multidimensional and incorporates all aspects of life (Bowling, 2001). Biological, psychological and social processes are cumulative in the ageing process (Tornstam, 2001). As a consequence, pain and related effects on health will be modified not only by earlier experiences of pain but also influenced by the individual's health status, context, social and psychological situation, as well as existential problems. There are indications that the concepts and concerns related to QoL in older age groups differ from those of the general population. As it is of interest for Clinicians to measure the clinical outcome and changes in health, it is logical to measure Health Related Quality of Life (HRQoL). However, it is important to remember that there are differences between QoL and HRQoL and that none of the dimensions indicate the actual health status. Normal ageing does not necessarily influence QoL in a negative way (Netuveli et al. 2008). As life expectancy has increased and people are living to a more advanced age, pain and the increased risk of other disease-related conditions constitute a significant problem that must be addressed in order to maintain high QoL.

There is strong evidence of a correlation between pain and QoL among older adults (Leadley et al. 2014). In an investigation of older adults 72.5 +/- 11.2 years, Hofman and colleagues found that pain and co-morbidity were of greater importance for QoL in the younger age groups, while disabilities and lack of social interaction were more important for the oldest age groups (Hofman et al. 2015). A

cross-sectional survey of 65-year old patients showed that the most frequent comorbidity in both men and women was mood disorder with chronic pain and arthrosis. Pain had an impact on HRQoL, but in contrast to the findings of Leadley and colleagues (Leadley et al. 2014), only in women (Baladon et al. 2015). Adaptation and resilience might play a part in maintaining high QoL.

Aims

The general aims of this thesis were to illuminate the impact and experience of pain among older adults, in order to contribute to the area of pain research and gender differences among the elderly. Because pain is “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”, (Merskey and Bogduk, 1994), it interacts with biological, social and emotional factors, as well as external factors from the surrounding environment. As human perception makes individuals bio-psycho-social beings, it is reasonable to study pain and its impact on the individual by exploring the parts, in order to achieve the goal of obtaining an idea of the big picture, i.e., the whole.

The specific aims were:

Study I: To conduct a cross-sectional investigation to identify pain among older adults from a gender perspective, i.e., the prevalence and frequency of reported pain, from which part(s) of the body the pain emanated, the estimated intensity and the treatment provided to alleviate or eliminate it.

As a large percentage of elderly people who reported pain received no treatment, it raised questions about how they perceived their QoL. As a consequence, the aim of the second study was to investigate the relationship between pain and QoL. Study I also led to the planning of subsequent studies with a gender perspective.

Study II: To assess and evaluate the influence of biological, social, psychological and existential factors on the relationship between pain and QoL in women and men aged 60 years and over and if the relationship was the same regardless of gender.

It is known that neuroticism affects pain perception in younger adults living with pain. Because personality traits are stable over time, the question in study three was whether personality traits are important for pain perception in the elderly.

Study III: To investigate possible associations between pain and the personality dimensions of neuroticism, extroversion, openness, agreeableness and conscientiousness among persons aged 60 years and older. An additional aim was to explore whether such associations are the same in both women and men.

Study IV: To investigate reported pain among older adults aged 72 years and older over time, as measured in a population-based sample followed for a period of nine years. Additional aims were to establish whether insomnia, financial situation, internal locus of control and external locus of control were associated with pain relief in a representative sample of older women and men by means of multivariate models and to determine whether pain leads to premature death, using the Kaplan Meier survival analysis.

Study population and methods

Study population

The SNAC (Swedish National Study on Aging and Care) is a longitudinal, national, multicentre study following a sample of age-stratified older adults in various (10) age cohorts (60 – 96 years). It investigates the patterns of health and living conditions of the Swedish population aged 60 years and over. In order to obtain sufficient material in the oldest age cohorts, all individuals aged 84 years and older born during a given month were invited to participate (month sample). Full details of the study structure, design, population and recruitment have been described by Lagergren et al. (Lagergren et al. 2004). The SNAC is conducted at four research centres and started in 2001. This thesis is based on results collected from the participants in the county of Blekinge, which is one of the four research centres that form the SNAC. Potential participants (2,312) received a letter with an invitation to participate and 1,402 accepted (see fig 1). Reasons for declining participation (910 subjects, 555 (61%) women and 355 (39%) men) were lack of willingness (83%), feeling too ill (10%) and could not be contacted (7%). The mean age among those declining participation was 80.9 years and they were distributed in age-groups as shown in Table 1 (See Table 1).

Table 1

The Swedish National Study on Aging and Care: individuals who declined participation in age-groups

Age of declining individuals n=910		
Age (years)	Frequency n	percent
60-65	72	8
66-71	59	6.5
72-77	82	9
78-80	90	9.9
81-83	99	10.9
84-86	178	19.5
87-89	158	17.4
90-92	95	10.4
93-95	64	7
96-	13	1.4
Total	910	100

In the SNAC-Blekinge in Karlskrona 1,402 individuals were included in the baseline survey. This sample resembles the other rural and urban samples in the entire SNAC study. The respondents, 585 men and 817 women, underwent a medical examination and testing conducted in two sessions and answered a questionnaire. (Papers I, II and III). The Mini mental test, (MMT), presented as mean and standard deviation, (Std), is given for each group as a measure of cognitive function.

Table 2

Participants with and without pain at baseline in the Swedish National Study on Aging and Care - Blekinge. The Mini mental test, (MMT), presented as mean and standard deviation, (Std), and according to gender in the pain/no pain groups.

No pain	Baseline n=1402 817 (58,3%) women 585 (41.7%) men	Pain
(n=633 (45.2%))		(n=769 (54.8%))
MMT (n=1364), mean 26.02, Std 5.010		
women 321/633 (50.7%)		women 496/769 (64.5%)
MMT (n= 309) mean 24.35, Std 6.74		MMT (n=482) mean 26.49, Std 4.37
men 312/633 (49.3%)		men 273/769 (35.5%)
MMT (n=301) mean 26.16, Std 4.64		MMT (n=272) mean 26.95, Std 3.52

The SNAC-B sample included in study IV consisted of individuals aged 72 years and older at baseline who underwent the same investigation at the 9-year follow up (study IV). How this group answered the question about pain and the Mini Mental Test is therefore reported in a separate table (See Table 3).

Table 3

Participants, aged 60 years and 66 years (i.e. younger than 72 years), with and without pain at baseline in the Swedish National Study on Aging and Care - Blekinge study. The Mini mental test, (MMT), presented as mean and standard deviations, (Std), and genderwise for the pain/no pain groups.

No pain n=167	Younger than 72 Years n=397 208 (52.4%) women 189 (47.6%) men	Pain n=230
women	women	
69 (33.2%)	139 (66.8 %)	
MMT (n=69) mean 28.22, Std 1.84	MMT (n=138) mean 28.39, Std 2.57	
men 98	men	
98 (51.9%)	91 (48.1%)	
MMT (n=97) mean 28.72 Std 1.48	MMT (n=91) mean 28.46 Std 1.79	

Study IV: At baseline 1,005 individuals were included, of whom 328 remained at follow-up. Data were collected from the death register to analyze the loss of participants (See Table 4).

Table 4

Participants aged 72 years and older, with and without pain at baseline in the Swedish National Study on Aging and Care - Blekinge and participants aged 81 and older, with and without pain at baseline who were included in the follow-up 9 years later. The Mini mental test (MMT) presented as mean and standard deviations (Std and genderwise for the pain/no pain groups

No pain (n=466 (46.4%))	Baseline n=1005 609 (60.6%) women 396 (39.4%) men		Pain (n=539 (53.6%))
	MMT n =969 mean 25.03, Std 5.50		
252 (41.4%) women			357 (58.6%) women
MMT n=240 mean 23.24, Std 7.21			MMT n=344 Mean 25.73, Std 4.71
214 (54.0%) men			182 (46.0%) men
MMT n=97 mean 28.72, Std 1.48			MMT n=181 Mean 26.19, Std 3.91
Mortality	Lost to follow up	Mortality	Lost to follow up
n=307;	n=25	n=307;	n=38
165 women	19 women	195 women	26 women
MMT n=172 mean 21.02, Std 7.79		MMT n=208 mean 24.21, Std 5.64	
142 men	6 men	112 men	12 men
MMT n=138 mean 23.58, Std 5.77		MMT n=123 mean 25.43, Std 4.55	
No pain n=134	Follow up n=328 204 (62.2%) women 124 (37.8%) men		Pain n=194
68 (33.3%) women			136 (66.7%) women
MMT n=68 mean 27.68, Std 1.89			MMT n=136 mean 27.46, Std 2.02
66 (53.2%) men			58 (46.8%) men
MMT n=66 Mean 27.44, Std 2.52			MMT n=58 Mean 27.43, Std 2.10

The study designs used in this thesis are cross-sectional (Studies I, II and III), and longitudinal (Study IV). The purpose of the chosen methods was not only to gain insight into the number of elderly people who live with pain and its consequences, but also to follow them over time to determine whether pain changes over time and with increasing age.

Table 5
Studies in the thesis

Study	I	II	III	IV
Design	Quantitative cross-sectional	Quantitative cross-sectional	Quantitative cross-sectional	Quantitative longitudinal
Sample	n=1402 participants >60 years	n=1402 participants >60 years	n=1402 participants >60 years	n=1005 participants >72 years
Data collection	SNAC baseline 2001-2003	SNAC baseline 2001-2003	SNAC baseline 2001-2003	SNAC baseline 2001-2003 Reinvestigation 2010-2012
Data analysis	Chi-squared test	Multiple logistic regression	Multiple logistic regression	Multiple logistic regression Kaplan Meier Survival analysis
Confounding factors	age gender financial status living alone education co-morbidity	pain age insomnia living alone low SoC co-morbidity financial status low education	neuroticism age insomnia low financial status educational level	insomnia educational level ILOC eLOC

SNAC =Swedish National Study on Aging and Care

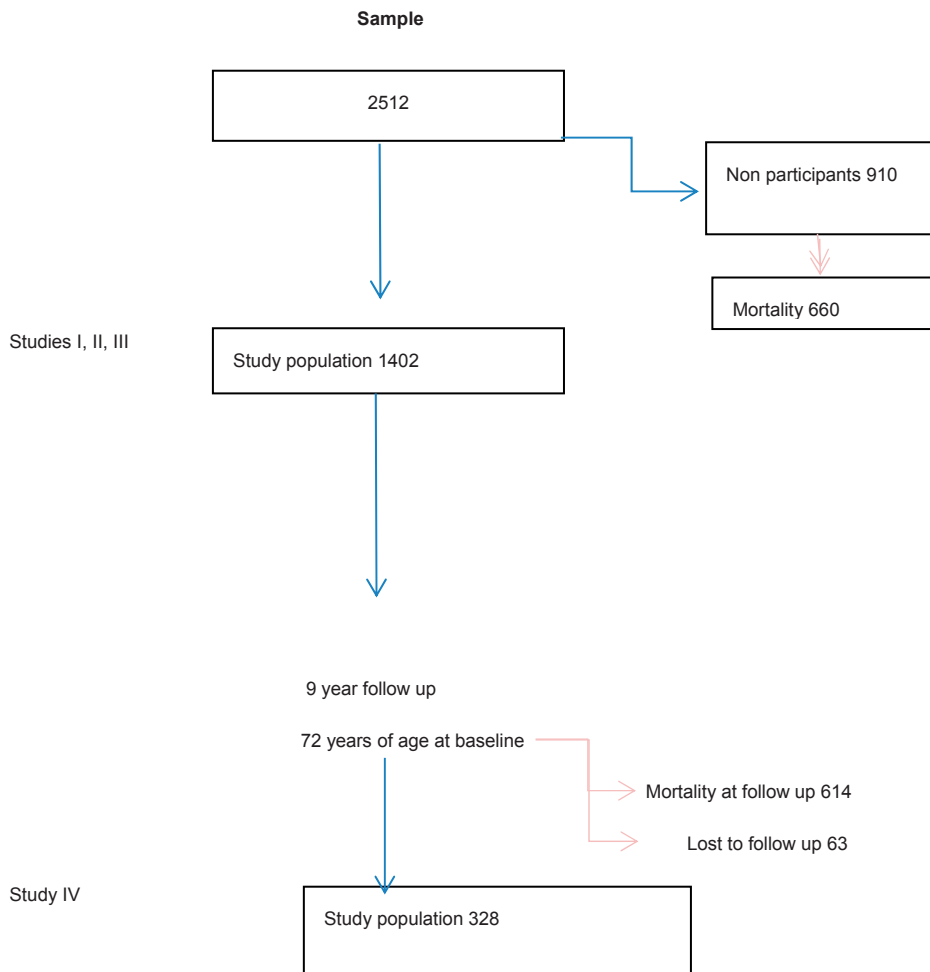


Figure 1
Flow chart of sample

Measures

Demographic data, (age, gender, whether living alone or not, educational level and financial situation), were self-reported and collected from the questionnaire.

The independent variable pain was self-reported and based on the question: Have you had an ache/pain during the past 4 weeks? The response alternatives were ‘Yes’ and ‘No’. This question was followed by a number of questions concerning the pain, e.g., in which part(-s) of your body is the pain worst? The participants

could choose more than one response alternative. In addition, they were asked to indicate the average level of pain on the visual analogue scale (VAS).

Pain intensity was measured on the VAS scale, a one-dimensional continuous 100 millimetre straight line, with endpoints denoting the extremes of no pain and worst possible pain. The VAS is a validated instrument for pain that is user-friendly and not time-consuming (Price et al. 1983). The participants indicate the point that best represents their current pain by placing an x on the line. Helme et al. concluded that older adults are able to differentiate between the emotional and sensory aspect of pain and that therefore the VAS instrument can be used for the elderly (Helme et al. 1989). The results were then categorized on a graphic rating scale in centimetres. The three groups were classified as mild pain (0-3.99), moderate pain (4-6.99) and severe pain (7-10).

Sleep disturbances were covered by the question: Do you regularly suffer from insomnia? The response alternatives were 'Yes' and 'No'. This question concerns self-reported perceived sleep problems and does not take into account what kind of sleep disturbance the individual is bothered by.

The question concerning the participants' financial situation, i.e., whether they had savings or a low economic status, was: If necessary, could you raise the sum of 14,000 SEK (about 2,000 USD) for unexpected expenses within one week? The response alternatives were 'Yes' and 'No'. This question from the SNAC database was based on a Swedish survey of income and living conditions (Statistics Sweden, 2004).

Questions about educational level was dichotomized and measured with the question: Did you finish secondary school? The response alternatives were 'Yes' and 'No'.

Medication and treatment data were self-reported. The question concerning treatment was: "Is your pain being treated?" and the response alternatives were: a) no medication; b) medication; c) other treatment (e.g., physiotherapy, transcutaneous electrical nerve stimulation, ultrasound); and d) both medication and other treatment. Acetaminophen is the first choice when prescribing pain medication, although it can also be bought without prescription. No distinction was made in the data collection between self-care medication and prescribed painkillers.

Information on HRQoL was obtained by means of the health survey short form (SF-12), which is an instrument tested for Swedish conditions (Sullivan et al., 1997 and Sullivan et al., 2002). The survey consists of twelve questions that measure functional health and well-being. The validated instrument is a reliable measure of physical and mental health from the individual's point of view. There

is evidence of both the internal consistency and test-retest reliability of the SF12 (Haywood et al. 2005). The instrument provides an estimated score of an individual's health in eight dimensions: Physical functioning, Physical activity, Pain, General health, Vitality, Social functioning, Emotional capacity and Mental health (Sullivan et al. 1997). The response alternatives to the twelve questions, were 'Yes' or 'No'. The scores were processed in accordance with the Swedish Manual and Interpretation Guide (Sullivan et al. 1997, 2002). The physical component score (PCS-12) and mental component score (MCS-12) were obtained by means of the standard scoring algorithm provided by Ware et al. (1996), who designed the instrument. As the concept of pain partly overlaps the PCS-12 in the SF-12, the analyses were conducted using the MCS-12. The holistic approach and health perspective meant that high QoL was defined as the upper 25th percentile, corresponding to a cut-off point of 60.4. Participants in the lower 75th percentile were thus defined as having low QoL. In study II, mean mental health scores adjusted for age and gender were collected from the Swedish statistics.

Information on personality traits was obtained by means of the personality SGC1 questionnaire, a 60-item Swedish version of Costa & McCrae's the five factor model, (FFM), questionnaire (Costa and McCrae., 1997). The questions had 7 response alternatives ranging from (1) completely disagree to (7) completely agree. The questions were then categorized (sometimes in reverse order in accordance with the instrument key) into the FFM traits (Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness). The mean Cronbach's Alpha for the SGC1 was 0.72 (n 0.81; E 0.77; O 0.58; A 0.62; C 0.80) (Study III).

Locus of control (LOC) was measured using a short version of the original multidimensional Health Locus of Control (MHLC) Scales (Wallston et al., 1978). The original version includes three subscales measuring one internal (i) and two external (e) kinds of control belief. The external (e) LOC alternatives are "*authority figures*" and "*circumstances beyond one's control*". The original scale has 18 items (6 items for each subscale). The validity of the instrument has been investigated in a review study (Wallston, 2005). The results demonstrated that it validly measures the concept of health LOC. In the database used in the present study, three items from the internal locus of control (iLOC) subscale were available: 1. If I fall ill, it is my own behavior that determines how soon I recover, 2. I am in control of my health and 3. If I take care of myself, I can avoid illness. The range of possible scores was 3 - 15 points and high scores indicated a stronger iLOC. The Cronbach's alpha for iLOC was 0.67.

Three items from the external locus of control (eLOC) subscale were available: 1. My nearest and dearest are very important for whether I remain healthy or fall ill 2. My recovery from illness is usually because my nearest and dearest have cared

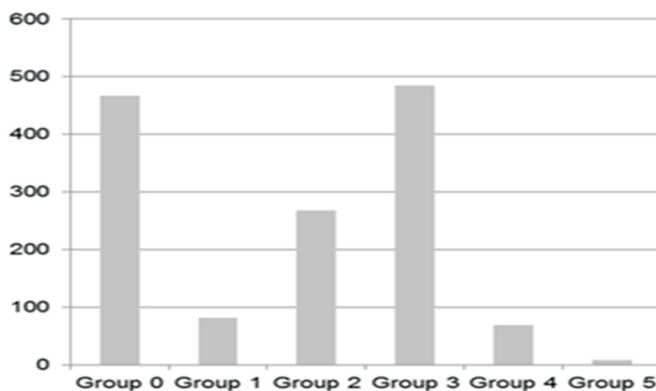
for me well 3. When it comes to my health, all I have to do is follow my doctor's orders. The range of scores was 3-15 points and high scores indicated a stronger level of eLOC. The Cronbach's alpha for eLOC was 0.52.

Cronbach's alpha was used to assess internal reliability (Cronbach, 1951). Alpha values between 0.7 – 0.9 are considered acceptable. In study IV the index had a lower alpha value than recommended. The two scales measuring internal and external LOC each consisted of three questions, which may explain the low homogeneity of the instrument and make the lower index acceptable (Streiner & Norman, 2000).

Co-morbidity was measured using the Johns Hopkins Adjusted Clinical Groups (ACG) Case Mix System 6.0. Special algorithms based on various diagnoses were used and validated (Carlsson et al. 2004, Halling et al., 2006). The five criteria employed were: 1. likely persistence of the conditions in question, 2. their severity, 3. their etiology, 4. their diagnostic certainty and 5. the patient's need for special care. The subjects were then assigned to one of the 82 ACG groups with the same degree of co-morbidity but without measuring their functional capacity. The diagnoses were obtained from electronic patient records for a period of up to two years prior to the SNAC study (n=1,378). The 82 ACG groups were then merged into six (0-5) groups, 0 indicating no need and 5 a great need of health care. The mean co-morbidity was 1.73 (s.d. 1.40) and the median was 3 (See Table 6).

Table 6

Comorbidity among women and men (n=1,379) from the Swedish National Study on Aging and Care – Blekinge (SNAC-B).



Sense of Coherence (SoC) was measured by a translated short form of 13 questions from the original 29-question instrument, using the scoring algorithm provided by the designer (Antonovsky, 2005). The shorter version was employed to avoid burdening the participants. The instrument served as a self-assessment of

SoC. It comprised seven response alternatives numbered from 1 (never) to 7 (very often) and the sum gave a score range of 13 – 91. As low, normal and high SoC are not defined, the mean score (72.23) was used to dichotomize the variable. Thus scores below the mean were classified as low SoC, because it was considered to be normally distributed.

The Mini-mental test (MMT) measures cognitive impairment by means of an instrument containing 20 questions divided into 11 areas. The questions cover orientation to time and place, memory, language and visuospatial functions (relating to visual and spatial interpretation capability). In this thesis, a result of 24 points (out of 30) was used as cut off to indicate dementia. The MMT captures all the symptoms of Alzheimer type dementia, although the result can be affected by age, education and language habits. The test does not provide information on the causes of cognitive impairment. The MMT has high sensitivity and specificity in outpatients aged over 65 years (Harvan and Cotter, 2006).

Statistical Analysis

The data were analyzed using PASW Statistics 17.0, 19.0 and 22.0 (SPSS Inc. Chicago, IL, USA). Descriptive analyses and group comparisons were made by means of the Chi Square test and four field tables. The results were reported as frequencies, percentages and confidence intervals, with correlation presented as Pearson correlation. Multiple logistic regressions were used for associations between variables. Those considered to be confounding variables (age, financial status, living alone, education, insomnia, SoC, iLOC, eLOC, comorbidity and personality traits) were included in the analyses.

Associations with confounding factors have been adjusted for by multivariate logistic analysis. The logistic regression analyses are presented as Odds Ratios (OR), i.e., the ratio between the odds that an event will or will not occur. The probability values (p-values) are provided for statistically significant results. P-values of less than 0.05 were considered significant. The critical level of confidence interval (C.I.) was set at 95%. This level, or below, was considered statistically significant.

Missing data are indicated by stating the number of participants (n) in all analyses.

Ethical considerations

The driving force, i.e., the ultimate reason for research on humans, is to create or improve the conditions for a good life. The purpose of this thesis is to gain a deeper understanding of how pain develops over time and what impact pain has among older adults. Research can also be aimed at the development of diagnostic, preventive and curative interventions but irrespective of the intention, the individual's health and self-determination must be the main guiding principle, as human rights are central when conducting medical research. Curative interventions were highlighted in this thesis, while at the same time the integrity of the participants was safeguarded. The Declaration of Helsinki (developed by the World Medical Association (WMA)) is a statement of ethical principles for medical research involving human subjects, including research on identifiable human material and data. This declaration has been my guiding principle during the work on the present thesis. One way to avoid identification was to present all results on gender and group levels.

A plan was made of how to carry out the studies included in this thesis. Presentations of the data have been carefully considered in order to protect the integrity of each individual.

The SNAC study was approved by the Ethics Committee of the Medical Faculty at Lund University Sweden (Dnr LU 605-00, LU 744-00). The privacy of the study participants has been protected in this thesis. All collected data have been treated with confidentiality in order to minimize the risk of the research damaging their social, mental or physical integrity.

Results

Paper I

Of the study population, (n=1402), the mean age was lowest among individuals reporting pain but women were consistently older than men. In total, 769/1402 (54.8%) older adults in different age cohorts reported pain, 496/817 (64.5%) women and 273/585 (35.5%) men, $p < 0.001$, (See Table 7).

Table 7

Age of women and men with pain from the Swedish National Study on Aging and Care – Blekinge (n=769)

Age (years)	women		men	
	Frequency n	percent	Frequency n	Percent
60-65	64	12.9	43	15.8
66-71	75	15.1	48	17.6
72-77	71	14.3	39	14.3
78-80	52	10.5	37	13.6
81-83	52	10.5	34	12.5
84-86	73	14.7	43	15.8
87-89	53	10.7	16	5.9
90-92	37	7.5	8	2.9
93-95	16	3.2	5	1.8
96-	3	0.6	0	0.0
Total	496	100	273	100.0

The location of the worst pain (more than one possible) was distributed over seven groups, of which the legs' (including feet) was the most frequently reported. Women experienced significantly more pain located in the vertebral column compared to men, $p < 0.01$ (Table 8).

Table 8

Pain among older adults (60-96 years) at the baseline investigation in the SNAC-B study (n=769). Worst pain area (%) among women and men. More than one area was possible.

worst pain	total	women	men	P-value
head	138/742 (18.6%)	93/481 (19.3%)	45/261 (17.2%)	0,49
neck	253/751 (33.7%)	173/487 (35.5%)	80/264 (30.3%)	0,15
vertebral column	445/755 (58.9%)	307/490 (62.6%)	138/265 (52.1%)	0,01
joint	379/755 (50.2%)	253/488 (51.8%)	126/267 (47.2%)	0,22
shoulder	363/754 (48,1%)	247/487 (50.7%)	116/267 (43.4%)	0,06
leg	517/756 (68.4%)	339/489 (69.3%)	178/267 (66.7%)	0,45
chest	130/751 (17.3%)	84/488 (17.2%)	46/263 (17.5%)	0,92

SNAC-B = Swedish National Study on Aging and Care – Blekinge.

The mean VAS score among women was 5.50 (SD 1.94) and among men 5.19 (SD 2.00). The majority 586/704 (83.2%) rated their pain as 4 or higher (moderate/severe), more women than men, 380/443 (86.0%) and 206/261 (79.0%), respectively ($p<0.02$). Among men, pain intensity declined at older age (Pearson Chi Square 101.33, $p<0.01$), while no difference in pain intensity was found with increasing age among women (Pearson Chi-Square 84.35, $p<0.38$).

Use of prescribed painkillers was reported by 283/478 (59.2%) women, compared to 128/263 (48.7%) men, $p<0.01$. Other treatment such as physiotherapy and heat/cold therapy was prescribed for 64/478 (13.4%) of the women and 24/263 (9.1%) of the men. A total of 128/263 (48.7%) of the men received no treatment whatsoever for their pain compared to 177/478 (37.0%) of the women, $p<0.01$.

In a multivariate forward logistic regression model adjusted for age, gender, financial status, living alone, education and co-morbidity, being of female gender resulted in the highest OR (OR 1.94, C.I. 1.51-2.49) for pain but low educational level (OR 1.32, C.I. 1.01-1.72), co-morbidity (OR 1.24, C.I. 1.13-1.35) and younger age (OR 1.17, C.I. 1.05-1.30) also revealed an elevated OR (Table 9).

Table 9

Pain among older adults 60-96 years from the SNAC-B study. Logistic forward regression models illustrating the association between independent variables and pain (n=1,194).

control variables	model I		model II		model III		p-value
	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.	
age (younger)	1.07	0.98-1.18	1.11	1.00-1.23	1.17	1.05-1.30	<0.01
gender (women)	1.99	1.57-2.52	1.94	1.51-2.48	1.94	1.51-2.49	<0.01
financial status			1.20	0.88-1.65	1.16	0.84-1.60	
living alone			1.08	0.82-1.43	1.05	0.80-1.40	
education			1.36	1.05-1.77	1.32	1.01-1.72	<0.39
comorbidity					1.24	1.13-1.35	<0.01

Nagelkerke R square 0.07

SNAC-B = Swedish National Study on Aging and Care – Blekinge. C.I. = confidence interval

Paper II

The participants who reported pain had a mean age of 76.0 years compared with a mean age of 77.6 years among the older adults without pain. Pain was not more common among the oldest old (81 years and older) (340/662, 51.4%) than in the younger groups of older adults in the study population (60 - 80 years), (429/740, 58%), n.s.

Insomnia was reported by 304/702 (43.3%) in the pain group and by 110/511 (21.5%) of those without pain, $p < 0.001$.

A high degree of co-morbidity (3-5) was reported by 562/1379 participants (40.8%) and was more common among women, $p < 0.05$. The 237 women with pain (48.3%) had higher co-morbidity compared to the 106 men with pain (39.3%), $p < 0.001$.

Of the individuals who reported pain, 352 (45.8%) were living alone. Corresponding figures for the group without pain were 235 (42.7%), n.s.

The mean SoC score was generally lower among women, while participants of both genders who reported living with pain had lower scores. A low economic status was reported by 160 women (22.3%) and 72 men (13.6%). The majority of participants had a low educational level; 686 women (92.8%) and 464 men (86.2%).

The logistic regression analyses were performed using five steps for each gender.

In the final model for women, pain still yielded the highest OR (OR 2.27, C.I. 1.36-3.78) for low QoL followed by low economic status (OR 1.75, C.I. 1.08-2.84), co-morbidity (OR 1.24, C.I. 1.05-1.46), low SoC (OR 1.08, C.I. 1.06-1.10) and lower age (OR 1.05, C.I. 1.02-1.08).

In the final model for men, the strongest OR for low QoL was found for insomnia (OR 1.86, C.I. 1.04-3.33) followed by low SoC (OR 1.08, C.I. 1.05-1.11) and lower age (OR 1.04, C.I. 1.01-1.07), which relationships remained stable after controlling for the covariates.

Paper III

Among women, the neuroticism personality trait was associated with pain (OR 1.05, C.I. 1.03-1.08) (See Table 10 a). In men, both neuroticism (OR 1.03, C.I. 1.002-1.07) and openness (OR 1.04, CI 1.005-1.08) were associated with pain (See Table 10 b). No relationship between personality traits and pain intensity was detected (n.s.).

Table 10 a

The relationship between pain and personality among adults 60-96 years from the SNAC-B study (n=1,402); Logistic backward regression models illustrating the association between personality traits and pain in women (n=696)

Trait	Odds ratio	p-value	95% confidence interval
neuroticism	1.05	0.01	1.03-1.08
extraversion	0.99	0.76	0.96-1.03
openness	1.01	0.71	0.98-1.04
agreeableness	1.01	0.53	0.98-1.04
Consciousness	1.00	0.96	0.97-1.03
constant	0.23	0.92	

Nagelkerke R square 0.042

SNAC-B= Swedish National Study on Aging and Care – Blekinge.

Table 10 b

The relationship between pain and personality among adults 60-96 years from the SNAC-B study (n=1,402): Logistic backward regression models illustrating the association between personality traits and pain in men (n=522)

trait	odds ratio	p-value	95% confidence interval
neuroticism	1.03	0.04	1.002-1.07
extraversion	0.97	0.10	0.94-1.005
openness	1.04	0.02	1.005-1.08
agreeableness	1.00	0.87	0.96-1.04
conscientiousness	1.02	0.34	0.98-1.05
constant	0.18	0.17	

Nagelkerke R square 0.027

SNAC-B= Swedish National Study on Aging and Care – Blekinge.

Significantly related personality traits were then tested based on gender by means of multivariate forward logistic regression in models adjusted for age, insomnia, financial status and educational level (Table 11 a and b).

In model 1, the strength of association between pain and the traits was about the same for women and men. In women, the trait N was associated with pain (OR 1.06, C.I. 1.03-1.09). In men, both the traits N (OR 1.04, C.I. 1.01-1.06), and O (OR 1.04, C.I. 1.001-1.07) were associated with pain.

In model 2, no association with younger age was found for either men or women.

In model 3, the OR for the neurotic personality trait remained weak but significant for both genders. In women, insomnia had the highest odds ratio for pain (OR 2.18, C.I. 1.52-3.12) followed by the trait neuroticism (OR 1.05, C.I. 1.03-1.08) and younger age (OR 1.02, C.I. 1.001-1.04). In men, the OR for insomnia was (OR 1.99, C.I. 1.25-3.16) followed the traits neuroticism (OR 1.03, C.I. 1.002-1.06) and openness (OR 1.03, C.I. 1.001-1.07).

Model 4; no association with low economic status was found for either men or women and no changes in the relationship between pain and personality traits, age or insomnia were noted.

Model 5; in the final model for women, insomnia still yielded the highest odds ratio for pain (OR 2.19, C.I. 1.52-3.15) followed by low educational level (OR 1.59, C.I. 1.07-2.36). The Neuroticism (OR 1.05, C.I. 1.02-1.08) and belonging to the younger group of older adults (OR 1.02, C.I. 1.005-1.04) remained stable. A strained financial situation was not significantly related to pain. (Table 11 a).

Table 11 a

The relationship between pain and personality among adults 60/96 years from the SNAC-B study, (n=1,402); Logistic forward regression models illustrating the association between independent variables and personality in women (n=643).

	model I		model II		model III		model IV		model V	
control variables	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.
Neuroticism	1.06	1.03-1.09	1.06	1.04-1.09	1.05	1.03-1.08	1.05	1.03-1.08	1.05	1.02-1.08
Age (younger)			1.02	1.00-1.03	1.02	1.001-1.04	1.02	1.001-1.04	1.02	1.005-1.04
Insomnia					2.18	1.52-3.12	2.17	1.51-3.12	2.19	1.52-3.15
Low economic status							1.14	0.74-1.74	1.09	0.71-1.68
Low educational level									1.59	1.07-2.36

Nagelkerke R square 0.10

SNAC-B = Swedish National Study on Aging and Care – Blekinge.

In the final model for men, insomnia was found to have the highest odds ratio for pain (OR 1.98, C.I. 1.24-3.15) followed by the traits of neuroticism (OR 1.03, C.I. 1.002-1.06) and openness (OR 1.03, C.I. 1.001-1.07). Belonging to the younger group of older adults, having a strained financial situation and low educational level were not significantly related to pain. The relationship between personality traits and pain was only affected to a minor extent by insomnia (Table 11 b).

Table 11 b

The relationship between pain and personality among adults 60/96 years from the SNAC-B study, (n=1,402); Logistic forward regression models illustrating the association between independent variables and personality in men (n=490).

	model I		model II		model III		model IV		model V	
control variables	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.	adj Odds Ratio	95% C.I.
Neuroticism	1.04	1.01-1.06	1.04	1.01-1.06	1.03	1.002-1.06	1.03	1.001	1.03	1.002-1.06
Openness	1.04	1.001-1.07	1.04	1.001-1.07	1.03	1.001-1.07	1.03	1.001-1.07	1.03	1.001-1.07
Age (younger)			1.00	0.98-1.02	1.00	0.98-1.02	1.00	0.98-1.02	1.00	0.98-1.02
Insomnia					1.99	1.25-3.16	2.00	1.26-3.18	1.98	1.24-3.15
Low economic status							1.17	0.68-2.03	1.17	0.68-2.03
Low educational level									1.31	0.84-2.04

Nagelkerke R square 0.10

SNAC-B = Swedish National Study on Aging and Care – Blekinge

Paper IV

Gender based differences in mean age between individuals with and without pain decreased with age and completely disappeared for men at the follow-up investigation. (See Table 12 and fig 2 a, b). The trends in the Kaplan- Meier survival analyses were non-significant.

Table 12

Mean age among women and men with and without pain at baseline (72 years and older) and at the nine year follow-up (81 years and older) from the SNAC-B study.

mean age	women with pain	women without pain	men with pain	men without pain
baseline	81.8 yrs. (SD 6.38) (n=357)	83.5 Yrs. (SD 6.46) (n=252)	80.4 yrs. (SD 5.64) (n=182)	82.0 yrs. (SD 6.12) (n=214)
9y follow-up	86.7 yrs. (SD 5.38) (n=69)	87.3 yrs. (SD 5.42) (n=135)	86.9 yrs. (SD 4.89) (n=27)	86.8 yrs. (SD 4.78) (n=97)

SNAC-B = The Swedish National Study on Aging and Care. SD = Standard deviation..

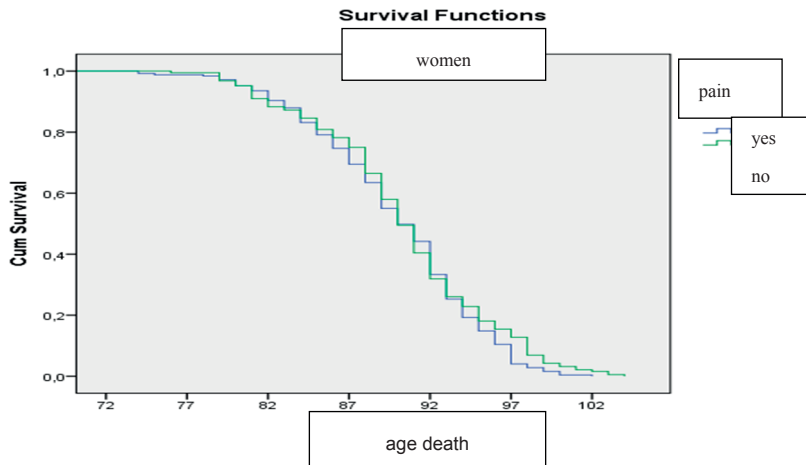


Figure 2 a

Kaplan Meier survival analysis showing the probability of death among women with and without pain at baseline and at the nine year follow-up in the Swedish National Study on Aging and Care (SNAC), Blekinge.

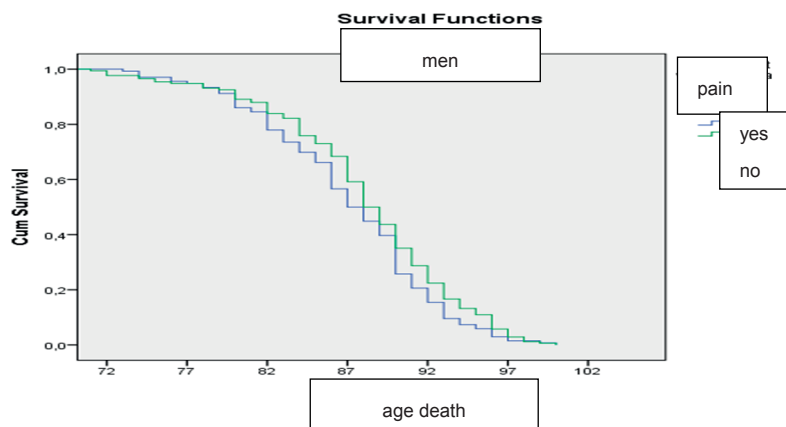


Figure 2 b
Kaplan Meier survival analysis showing the probability of death among men with and without pain at baseline and at the nine year follow-up in the Swedish National Study on Aging and Care (SNAC)-Blekinge.

At baseline, 357/609 (58.6%, C.I. 54.7 – 62.5) women reported pain and the corresponding number of men was 182/396 (46.0%, C.I. 41.1 – 50.9). The number of women with pain decreased to 69/204 (33.8%, C.I. 27.3 – 40.3) in the follow-up investigation. The number of men reporting pain in the follow-up measurement was roughly half the previous number, 27/124 (21.8%, C.I. 14.5 – 29.1).

The pain relief rate was high for women, 82/136 (60.3%, C.I. 52.1 – 62.5), but even higher for men, 44/58 (75.9%, C.I. 64.9 – 86.9). At follow up, the number of individuals reporting pain during the past 4 weeks was about the same for women, 15/135 (11.9%, C.I. 6.4 – 17.4) as for men 13/97 (13.4%, C.I. 6.6 – 20.2).

A multivariate forward logistic regression model for each gender was performed, with insomnia, financial status and locus of control (LoC) as covariates. (Table 13).

Table 13

The relationship between relief from pain among women and men, 72 years and older, from the SNAC-B study (n=123): Logistic forward regression models illustrating the association between the independent variable eLOC and relief from pain among women (Nagelkerke R square 0.08) and among men (Nagelkerke R square 0.35).

control variables	women			men		
	Odds Ratio	95% C.I.	p-value	Odds Ratio	95% C.I.	p-value
Insomnia baseline	1.40	0.55 - 3.58	0.48	21.20	0.58 – 781.40	0.10
Low educational level	1.77	0.61 – 5.14	0.29	3.78	0.32– 44.18	0.29
low iLOC	1.16	0.97 – 1.38	0.11	1.19	0.80 – 1.76	0.39
Low eLOC	1.01	0.97 – 1.04	0.74	2.18	1.13 – 4.22	0.02

SNAC-B = Swedish National Study on Aging and Care – Blekinge; iLOC = internal locus of control; eLOC = external locus of control

Low eLOC scores were found to have significant odds ratios (OR 2.18, C.I. 1.13 - 4.22) for pain relief among older men (72 years and older) given that the odds for relief increased 1.18 times for each lower step on the eLOC scale.

Mean MMT scores decrease with age but Std shows a widely-spread_cognitive function range in the oldest age groups. No statistically significant differences were found between individuals who reported pain and those who did not, (n.s.).

Discussion

Life expectancy increased by 25 years during the the 20th. century, initially as a result of reduced infant mortality, but after 1950 mainly due to increased life expectancy after 60 years of age, (Statistics Sweden, 2010). The proportion of elderly people in the population has grown and continues to increase. The results of this study demonstrate that pain among older adults is common and that knowledge of its origin and how to treat it can be obtained. As pain is “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”, (Merskey and Bogduk, 1994), it interacts with biological, social and emotional factors, as well as external factors from the environment. The findings from the included studies reveal that more than half of the older adults had pain and that it was more commonly reported by women than men. Most of the participants with pain (83%) rated the intensity as moderate/severe and the most common location for both women and men was the legs (paper I).

Regardless of its aetiology and character, pain can often have a negative impact on how the elderly feel physically, regardless of its aetiology and character. How people experience and handle pain is individual and no one can judge how much pain another person has because it does not only have physical causes but is related to how people feel in general, (Sturgeon & Zautra, 2015).

The most common treatment for older adults is drugs, either self-medication or prescription painkillers (paper I). Other treatments such as multimodal therapies and physical activity have proven successful among the younger part of the population. As comorbidity is common among the older adults, all types of treatment may have to be adjusted to suit the individual. This study also reveals that there are differences between women and men, which should be taken into account when developing and designing treatment.

Pain intensity declines with age among men but the corresponding decline in intensity has not been demonstrated in women (paper IV). The number of women who report pain declines with increasing age but remains higher than the figure for men. The rate of relief from pain is higher for men compared to women. Belonging to the younger group of older adults with pain has a negative influence on QoL (paper II). Pain is strongly associated with decreased physical function (Patel et al., 2013), which could be hard to accept and therefore lead to a sense of

low QoL. Is it possible that pain is, at least partly, a response to the high demands placed upon an individual by the working environment? After retirement these demands gradually decline, which might make it possible to achieve other, self-determined aims in life and lead to increased QoL in the oldest old. Another explanation could be that activity patterns may differ between younger and older adults, as well as expectations that pain is part of the aging process, which might result in greater acceptance with age (Fagerström and Borglin, 2010).

Pain was found to have the highest OR for low QoL among women (Wrancker et al. 2014). In men, insomnia was revealed to be the main contributor to low QoL (Paper II). For both sexes, insomnia was found to have the highest odds ratio for pain (paper II). It is well known that sleep deprivation causes hyperalgesia (Schuh-Hofer et al., 2013). In this thesis a strong relationship between pain and insomnia is demonstrated, but how they interact needs further investigation.

The relationship between personality traits and pain differed between women and men. Pain has a stable relationship with neuroticism in both genders, but also a relationship with the personality trait of openness among older men (paper III). The relationship between neuroticism and fibromyalgia in younger patients suffering from pain is well established (Malin and Littlejohn, 2012). As our findings revealed that many older adults obtained relief from their pain, it raises the following question; is it possible that ageing/retirement can cure fibromyalgia? Further investigations are necessary.

Low eLOC scores may contribute to relief from pain among men, which is in contrast to findings among older black women in the USA where the belief that one's health is not controlled by others was a significant predictor of greater pain intensity (Baker et al., 2008). Could it be that these findings are an expression of cultural differences? On the other hand, multimodal pain management courses devote a great deal of time to reducing eLOC. Providing such courses for older men who are living with pain might alleviate pain in more individuals and seems to be an issue for further investigation. The research field is open to examining which therapies are best suited to helping elderly persons with pain and the goal should also be to attempt to identify and understand the factors that prevent pain from developing, as well as those that contribute to recovery for both women and men.

This thesis indicates several factors related to societal development that could prevent low QoL in the rapidly growing aging population. Societal development is a factor that contributes to the increasing vulnerability of older people today. We live in nuclear families where the presence of grandparents is largely a thing of the past. Family memories and traditions have less space as globalization progresses. For better or worse more and more of our communication and information exchange takes place via IT and multimedia. Future health policy will have to

promote encounters between people and focus on personal relationships in order to prevent retirement becoming synonymous with social isolation.

A key strategy may be to adapt both the physical and the social environment to the individual in order to meet her/his needs and preferences. Technical solutions should provide support rather than replacing human relationships. This thesis highlights the fact that pain and low QoL are related and that gender aspects must be considered when analysing which measures are necessary for older adults (paper II, Skoog et al., 2014, Manteuffel et al., 2014).

Neither financial status nor educational level was found to have any relationship with pain among men. However, educational level seems to be related to pain among older women. This is in contrast to findings from the MultiCare Cohort Study of patients aged 65 years and older where pain-related morbidity was equally distributed across age and socio-economic groups (Schäfer et al., 2012). These results might be findings related to a particular period as society and educational levels are rapidly changing for better or worse. While higher educational levels will most probably be for the better, there is a risk that stress levels will increase, but these are issues for future research.

The proportion of men and women who were free of pain in the follow-up survey was very high, but this finding should be interpreted with caution as it could be explained by surgery or pain relief through medication. Nevertheless, the conclusion remains that pain becomes less common as we grow older, which may imply that it is time to kill the myth that pain is a natural phenomenon that comes with age. It ought to be a major goal for the public in general and health policy in particular to ensure that longer life is accompanied by better health and less disability. Planning pain management for an elderly individual requires an understanding of the patient's treatment goals and expectations, which are likely to change with more advanced age, comorbidities, as well as cognitive and functional status. Strategies must be developed to enable older people to become active partners in this process.

Knowledge of gender differences is also necessary if we are to meet the individual and involve her/him in the rehabilitation work. Further research should explore this issue.

Methodological considerations

Several methodological aspects must be considered when evaluating the strengths and weaknesses of the studies on which this thesis is based.

The Swedish National Study on Aging and Care (SNAC) is a longitudinal multicentre study designed to follow the aging process. It has aggregated data since 2001 and provides an opportunity to follow and evaluate how various life conditions change over time. Standardized protocols allow analysis of the participants, both individually and in groups. As the data are largely self-reported the risk of recall bias is ever present.

Samples for all four studies included in this thesis are from the Swedish National Study on Aging and Care - Blekinge (SNAC-B). The SNAC-B sample consists of a random (monthly) total inclusion of persons 81 years and older (81, 84, 87, 90 and 93 years), while the younger groups comprised a randomized sample (60, 66, 72 and 78 years). This approach of including all individuals aged 81 years and older was taken to obtain a cross-section of the oldest part of the population. Research personnel conducted the three hour medical examination both at baseline and at the follow-up investigation. This comprehensive survey entails the risk of fatigue in the participants, which can affect their responses. An opportunity to rest was offered to safeguard the accuracy of the data. The possibility of being examined in the home was offered to those who could not travel to the research centre. The SNAC-B respondents are considered representative of elderly people in Sweden. The MMT served as a measure of cognitive ability for comparison between groups.

Each individual in Sweden is assigned a unique civil registration number at birth, which allowed us to follow individuals over time and identify them in other data files. Thus, we had the opportunity to use the independent registry data from the death register.

A fair interpretation of the results must take some limitations into account. The rating of pain was based on whether the participants reported pain during the previous four weeks, which might have led to some misclassification, i.e., the inclusion of individuals with acute pain. However, there is no reason to believe that this distorted the results, as the procedure was identical nine years later. The rating of pain does not specify site or cause. Therefore, some site-related pain types, such as arthrosis, are less prominent than would be the case if different pain types and locations were assessed separately. Fishbain and colleagues pointed out that certain trait tests and inventories may not be independent of pain state, as trait scores can change in line with pain treatment (Fishbain et al., 2006). Despite the fact that adherence rates, such as adherence to medication, in women and men are

very similar, some differences exist and women are slightly less adherent in following specific recommendations (Franks et al., 2009). In this thesis it was not possible to predict changes in trait scores as a result of treatment. Another limitation is that the subjective experience of pain was self-reported and restricted to the four preceding weeks. However, the strength of the question is that it was used in other European studies of older adults (Thomas et al., 2004).

Neither financial status nor educational level was found to have any relationship with pain among men. Educational level seems to be related to pain among older women. When the present generation of older adults was younger, most families were supported by the husband's income, while the wife was responsible for the children and household. As a consequence, it is likely that the pension level at a later stage of life can explain why the financial situation is more important for women. On the other hand, education did not have any significant influence on the QoL of the older adults in our study, which contradicts previous findings, (Sherman et al., 2012).

Living alone contributes to a perception of low QoL in middle age (Al-Windi, 2005). Women living alone are more common in the SNAC-B, but among the older adults who reported pain it appeared that low SoC rather than living alone was the decisive factor. In contrast, Sherman et al. found that 75 year old persons living alone, especially women, reported lower well-being than other groups of older adults (Sherman et al., 2012).

Pain is common among older people and the majority suffer from insomnia (Lindström et al., 2012; Jaussent et al., 2011). In this thesis self-reported sleep problems, regardless of the type of disorder involved, are classified as insomnia. Van de Laar et al. discussed whether personality factors play a causal role in the development of insomnia as they found that the trait of neuroticism was a common trend among insomniacs (Van de Laar et al., 2010). Our results demonstrate that insomnia has the strongest association with pain and the highest OR. Personality traits only marginally decreased when adjusted for insomnia.

The mean SoC score was generally lower among women, while participants of both genders who reported living with pain had lower scores. The results of our study reveal that SoC plays an important role in the QoL of both women and men who experience pain, irrespective of whether or not they live alone. Bowling and colleagues showed that the main factor that influences QoL among people aged 65 years and over is social relationships, followed by health and economic status (Bowling et al., 2003). One possible explanation for the different findings could be the composition of the study sample, i.e., selected patient groups or the general population, as in the present thesis.

There is ample evidence in the literature to support the assertion that the multidimensional health locus of control (MHLC) subscales reliably measure individuals' health LOC beliefs, which is the construct they were designed to measure (Wallston and Wallston, 1982). However, validity is an elusive concept and cannot be properly addressed without knowing 'validity for what purpose?' (Wallston et al., 1978). Study IV examined the relationship between LOC orientation (internal or external LOC) and pain in a sample of older adults. The Cronbach's alpha was presented in order to reflect the internal consistency of the included items (Streiner and Norman, 2000). This value is dependent on the magnitude of the correlations between the items, as well as on the number of items in the scale. Because there were more than two response alternatives, the Cronbach's alpha should have been above 0.7 but as only three questions were included, a lower alpha value can be considered to indicate validity (Streiner and Norman, 2000).

The OR values of personality traits are statistically significant but generally very low in the older population compared with younger pain patients (Groß et al., 2009; Martínez et al., 2011). Therefore, the results should be interpreted with caution. It is important to bear in mind that a personality trait is a multi-dimensional construct and although attempts have been made to classify human beings into stereotypical categories, "The Big Five" traits only reveal the dominant facet of an individual's personality (Costa and McCrae, 1997). However, this population-based study highlights gender differences regarding traits associated with pain among older adults, which is in contrast to findings by Kröner-Herwig et al., whose laboratory study of students found no convincing evidence that gender differences in terms of pain are mediated by psychological characteristics (Kröner-Herwig et al., 2012). Could it be that our findings can be explained by the aging process? Nevertheless, a small but significant relationship to traits may help predict different aspects of pain among older adults.

The Kaplan-Meier nonparametric method is used to calculate a survival distribution, i.e., estimate the probability of survival past given time points. Furthermore, the survival distributions of two or more groups can be compared. The Kaplan-Meier survival distribution method was used in study IV to compare survival between those living with pain and those with no pain (i.e., at least one of these states – censored or event – must occur). The actual "survival time" should be clearly defined and precisely measured, which was possible by gathering data from the death registry. The time between occurrence of pain in the participant and the investigation date is "unknown" and therefore "not included" in the Kaplan-Meier analysis. For this reason the data in study IV are labelled left-censored data. Censoring and the event should be independent, i.e., any participant still alive at

follow-up will be recorded as "censored". There should be no secular changes during follow-up, such as new drugs or better screening that can bias the results. No new treatment strategies or medications for pain in the elderly were introduced during the follow-up period. Censoring must be similar in all groups tested, including the "amount" and "patterns" of censorship per group. The number of events was exactly the same in the group living with pain and in the group without pain. It was assumed that the censorship patterns were similar in the two groups.

The Kaplan-Meier analysis did not reveal any statistically significant differences for living with pain or not. In this longitudinal study, individuals aged 72 years at inclusion were followed for nine years. Only a few were still alive when the study ended. A nine-year follow-up is a long period, during which a great deal can happen. This can affect the outcome, because we do not know how many of those who died during the study period experienced pain before death. In a similar way the high proportion of elderly people who recover from pain can affect the results.

It is often a challenge to generalize the findings to an aging population. There may be problems obtaining data on the oldest and most fragile. In the SNAC-material, we know that 91 individuals (10%) declined participation because they perceived themselves as too ill. Attempts to compensate for this have been made by total (monthly) inclusion in the oldest age groups. The individuals included in the SNAC-Blekinge sample are roughly distributed according to gender and age in the same way as in the municipality and in Sweden as a whole (Lagergren et al., 2004, Statistics Sweden (SCB), 2004).

Conclusions

The contribution of the results presented in this thesis is a glimpse of pain in older adults. Besides showing the number of people who report pain in old age and the factors related to pain, it was gratifying to discover that a very large proportion of older people experienced relief from pain. The high rate of relief from pain among both women and men indicates that pain is not necessarily a consequence of growing older. This statement should be followed by the recommendation that sufferers should receive adequate pain relief. A significant proportion of these individuals do not receive appropriate treatment for their pain as revealed in previous studies (Breivik et al., 2006 and paper I). One conclusion is that assessment, prevention and treatment of pain among older adults are neither adequate nor equitable. The development of effective, evidence-based pain management for both women and men remains a challenge for the future. The discovery of a possible health-factor, low eLoc scores, might be useful in the arsenal of pain treatment for older men in the future.

Future perspectives

The general objectives of this thesis were to make the impact and experience of pain among older adults visible, as well as to contribute to the area of pain research and gender differences among older adults. Research needs to increase and deepen our understanding of the gender differences in all aspects of pain among older adults. As the causes of pain can vary in nature and sometimes appear together, it is important that each individual receives a treatment that takes her/his whole situation into account. Due to the fact that the SNAC does not reveal the type of pain reported (chronic, acute, fibromyalgia etc.), further studies are needed to deepen the knowledge in order to meet the specific needs of individuals seeking medical help.

The way in which psychological and social factors influence the experience of pain and its effect on QoL raises questions about best practice. Further research in this area from a gender perspective is therefore necessary.

Summary in Swedish

Svensk sammanfattning

Smärta är en multidimensionell obehaglig upplevelse som även ger känslomässig påverkan. Smärta är vanligt förekommande i den åldrande befolkningen men det är oklart hur själva åldrandet påverkar smärta och smärtupplevelse. Syftet med studie I var att undersöka hur vanligt förekommande smärta är, var det gör ont, vilken smärtintensitet som upplevs, vilken behandling som ordinerats och om dessa frågor besvarades lika mellan man och kvinna. Studie II undersökte inverkan av biologiska, sociala, psykologiska och existentiella faktorer på relationen mellan smärta och livskvalitet. Studie III undersökte om det finns någon relation mellan smärta och olika personlighetsdrag. Studie IV följer äldre individer (72 år och äldre) under nio år för att se om, och i så fall hur, smärta förändras över tid.

The Swedish National Study on Aging and Care, (SNAC), är en multicenterstudie som pågår vid fyra olika centra i Sverige. Blekinge, (B), utgör ett av dessa forskningscentra. Studierna är baserade på SNAC-B uppgifter från basundersökningen som genomfördes 2001-2003. Forskningspersonal genomför medicinsk undersökning och testning vid två tillfällen där varje undersökning omfattar cirka tre timmar. Totalt deltar 1402 individer som slumpmässigt valts ut ur befolkningsregistret indelat i tio olika åldersgrupper (60, 66, 72, 78, 81, 84, 87, 90, 93, 96- år). Studie IV har undersökt äldre än 72 år som följts i nio år. Studieprotokollen vid båda undersökningarna var identiska.

Resultat: Nästan hälften, (54,8 %) av den äldre befolkningen rapporterade smärta och det är vanligare bland kvinnor, ($p < 0,01$). Majoriteten upplevde moderat eller hög smärtintensitet (högre än 4 på VAS-skala) och kvinnor skattade smärtintensiteten högre än män, ($p < 0,023$). Smärtintensiteten sjunker med stigande ålder hos män, ($p < 0,013$). Smärtstillande läkemedel rapporterade 283/478, (59,2 %) kvinnor att de använder vilket är något vanligare än att män gör 128/263 (48,7 %), ($p < 0,013$). En stor andel av männen 128/263 (48,7 %), fick ingen behandling alls för sin smärta (studie I). Starkast oddskvot för låg

livskvalitet förelåg bland äldre kvinnor med smärta (OR 2.27, C.I. 1,36 – 3.78) vilket kontrasterar mot äldre män som lider mer av sömnstörningar (OR 1,86, C.I. 1,04 - 3.33). Detta talar för att upplevelse av hur smärta påverkar livskvalitet skiljer mellan män och kvinnor. Det finns även ett samband mellan personlighetsdrag och smärta fast även här skiljer det sig mellan könen. Relationen mellan personlighetsdraget neurotisk och smärta var ungefär lika mellan könen men för män fanns även en relation med personlighetsdraget öppenhet (studie III). Andelen som rapporterar smärta sjunker med stigande ålder, (81 år och äldre), men det är fortfarande vanligare att kvinnor rapporterar smärta än män. Det är vanligare att äldre män blivit av med sin smärta än äldre kvinnor. Att inte förlita sig så mycket på andra, (låga poäng på extern locus of control), kan vara en bidragande faktor till att män befrias från smärta.

Konklusion: Smärta är vanligt förekommande i den äldre befolkningen, särskilt hos kvinnor, men sjunker med ökande ålder och för män minskar även intensiteten. Hur smärta påverkar livskvaliteten skiljer mellan könen. Personlighetsdrag bör tas i beaktande men trots allt finns det gott hopp om att befrias från smärta för både äldre kvinnor och män. Att inte förlita sig så mycket på andra, (låga poäng på extern locus of control), kan bidra till att män blir av med sin smärta.

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*NOW THIS IS NOT THE END.
IT IS NOT EVEN THE BEGINNING OF THE END.
BUT IT IS, PERHAPS, THE END OF THE BEGINNING.*

SIR WINSTON CHURCHILL

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Paper I



ORIGINAL ARTICLE

Pain among older adults from a gender perspective: findings from the Swedish National Study on Aging and Care (SNAC-Blekinge)

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Abstract

Background and aims: Pain is common in the elderly population and its prevalence varies according to the studied disease, clinical setting, sex and age. This study examines pain in an aging population from a gender perspective. **Methods:** The Swedish National study on Aging and Care (SNAC) is conducted at four research centres. Participants were recruited from the baseline sample ($n=1402$) at one of the research centres, SNAC-Blekinge. Individuals aged 60 years and older were included and non-participation was documented. Research personnel conducted the medical examination on two occasions. **Results:** The prevalence of pain was 769/1402 (54.8%), distributed as 496/817 (64.5%) women and 273/585 (35.5%) men, $p<0.01$. Women reported more pain located in the vertebral column, $p<0.01$. The most common pain location was the legs and feet. About 84% reported pain intensity as 4 or higher on the visual analogue scale (VAS). Pain intensity declines with age among men, $p<0.01$. The most frequent treatment was painkillers. A total of 128/263 (48.7%) of the men received no pain treatment compared with 177/478 (37.0%) of the women, $p<0.01$. In a multivariate logistic regression model, women yielded the highest OR [OR 1.94 (C.I. 1.51–2.49)] for pain. **Conclusions:** Pain is common among older adults and there are significant differences between the sexes. Almost 55% of participants reported pain, predominantly women. In the majority of cases the intensity was rated as moderate or severe (VAS >4) and women rated higher than men $p<0.02$. Almost half of the men (48.7%) did not receive any treatment compared to 37% of the women, $p<0.01$.

Key Words: Pain, prevalence, treatment, older adults

Introduction

The pain and aging subfield has grown dramatically over the past two decades. Persistent pain in old age has only recently been focused on. One explanation for the previous lack of interest may be the common misconception that pain is a normal part of the aging process and, therefore, does not need to be addressed. The recent interest is based on the assumption that pain differs between younger and older individuals and that some populations require a different approach.

Diverging prevalence figures have been presented. One explanation for the inconsistent findings may be that the studies were conducted at a specialist clinic

or that specific diseases were investigated [1–4]. Researchers have estimated that approximately 50% of US adults aged >65 years suffer from pain and that pain prevalence is higher in females than males [5]. Nevertheless, we know very little about older individuals who live with pain, especially the oldest-old, as they are often excluded from studies [6,7].

Pain intensity is another area with inconsistent findings. Pain intensity did not differ by age group when studying younger adult patients with subjective temporomandibular disorder symptoms [8]. In laboratory research, age differences were found, where the older group was less sensitive to warm and painful

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heat stimuli than middle-aged participants [9]. A great deal of research has been carried out on the validity and reliability of different instruments to measure pain intensity, but still we know very little about how pain intensity changes with higher age.

Complicating factors in the study of pain in the aging population include diseases and medications. Co-morbidity and the experience of pain are complex phenomena, as the multidimensional experience consists of sensory, affective and cognitive components [10]. Comorbidity, which often results in multi-site pain, becomes more common with increasing age. Only certain aspects of how multi-site pain is distributed in the population (>60) are known. Among the UK population aged over 50 years, the number of pain sites was found to be a marker of low health-related quality of life [11]. In a German study, the number of pain sites was related to depression among community dwelling older adults [12]. The knowledge of the prevalence of multi-site pain in the population and which body parts are most commonly involved is still incomplete.

Bonica stated that there is no universal model for diagnosing or treating chronic pain patients [13]. Although treatment methods have improved and eventually become evidence-based, the need for individualized treatment models remains, especially among the elderly population [14]. Physiotherapy has been studied among older adults with back pain and found to lead to decreased pain intensity [15]. A multimodal approach is strongly recommended when treating older individuals with pain with focus on a combination of pharmacological and non-pharmacological treatment [16]. Pain killers (acetaminophen) remain the first choice [16].

Sex-related differences in the experience of both clinical and experimentally induced pain have been widely reported. Women report pain more often than men [17]. Older women suffer from their pain to a greater degree compared to men [18]. Large gender differences in the use of prescription drugs have been found [19]. A study, in which nearly 30 million adults (>18) were examined, revealed significant gender differences in terms of adherence to treatment and medication [20]. It is possible that some of these differences could be explained by personality traits since gender differences in perception of pain are related to traits [21].

The aim of this cross-sectional study was to examine pain prevalence, intensity, location and management in an aging population from a gender perspective based on the following questions: What is the pain prevalence in the older adult population in general? Are there gender differences regarding pain location and experienced intensity? What is the most common

form of treatment and is it divided equally between older women and men?

Materials and methods

Sample

The Swedish National Study on Aging and Care (SNAC), which started in 2001, is a national, population-based, prospective and longitudinal study running at four research centres. It was approved by the Ethics Committees of the Medical Faculty at Lund University and the Karolinska Institute, Stockholm, Sweden.

In SNAC-Blekinge (SNAC-B), 2312 individuals, of a representative sample of the population, randomized from the population register, were invited by post to participate in the study, of which 910 declined; of the 910 non-participants, 355 (39%) were men and 555 (61%) were women. Reasons for not participating in the study were: no interest 755 (83%); considering themselves too sick to participate 91 (10%); and 64 (7%) could not be contacted. The remaining 1402 (61%) accepted to participate. The data collection was designed to receive a randomly selected sample representing the old population in a broad variation of ages. Since the number of elderly people decreases with increasing age, all members of the age cohorts 81 years and over were invited to participate.

This representative sample of older adults in age cohorts (60–96 years at inclusion in the baseline survey) is followed over time. More details about the design and structure of the SNAC project have been presented by Lagergren et al. [22].

This study is based on the SNAC baseline sample at one of the four research centres, SNAC-B in Karlskrona, a medium-sized town with rural surroundings in the southeast of Sweden. In 2001, the municipality of Karlskrona had 60,596 inhabitants, of which 30,389 were women, and 30,207 men. The proportion of the population aged 60 years and older was 14,627 (24.1%) and the gender distribution was 8242 (56.3%) women and 6385 (43.7%) men. Our sample consists of 1402 individuals and is similar to other rural and urban samples of the total SNAC study in terms of age, sex, functional ability and perceived quality of life. Thus, the sample is considered representative of the Swedish elderly population, although no major Swedish cities are included.

Procedure

Potential participants were invited by letter to take part in the study. Those who did not reply were contacted by telephone (three attempts). A release form

allowing access to medical records and informed consent were provided. Examinations and tests were conducted by research staff in the course of two sessions, each of which comprised about 3 hours. A questionnaire was completed in the period between the two sessions. The data in this study were derived from the physical examination, patient records and the questionnaire, in which the participants reported their pain location and experienced pain intensity.

Measures

Pain intensity was self-reported on the one-dimensional VAS, a 10-cm line that ends with the extremes of pain intensity – worst possible pain and no pain [23]. The VAS assesses only one element of the pain experience – intensity, and the participants indicate, by placing an x on the line, the point that best represents their current pain. This instrument has been found to have strong validity and reliability among younger subjects [24]. Helme et al. concluded that older adults are able to differentiate between the emotional and sensory aspects of pain and that the VAS instrument can, therefore, be used with the elderly [25]. The results on the VAS are categorized into three groups: 0–3.99 (mild); 4.00–6.99 (moderate); and 7.00–10.00 (severe).

The presence and location of pain were identified by means of the question: Have you had an ache/pain during the last 4 weeks? This was followed by a number of questions concerning the pain, e.g., in which part(s) of your body is your pain worst? The participants could choose more than one alternative. In addition, they were asked to indicate the average level of pain on the VAS.

Medication and treatment data were self-reported. The question concerning treatment was: “Is your pain being treated?” and the response alternatives were: a) no medication; b) medication; c) other treatment (e.g. physiotherapy, transcutaneous electrical nerve stimulation, ultrasound); and d) both medication and other treatment. Acetaminophen is the first choice when prescribing pain medications, but the drug can also be bought without prescription. No distinction has been made between self-care medication and prescribed painkillers in the data collection.

Co-morbidity was measured using the Johns Hopkins Adjusted clinical Groups (ACG) Case Mix System 6.0. Special algorithms based on various diagnoses were used and validated [26,27]. The five criteria employed were: 1) Likely persistence of the morbidity conditions in question; 2) Their severity; 3) Their aetiology; 4) Their diagnostic certainty; and 5) The person's need for special care. The individuals were then assigned to some of the 82 ACG groups

with the same degree of co-morbidity, but without measuring the individual's functional capacity. The diagnoses were obtained from electronic patient records for a period of up to two years prior to the SNAC study ($n=1378$). The 82 ACG groups were then merged into six (0–5) groups; 0 indicates no need and 5 a great need of health care. The mean co-morbidity was 1.73 (SD=1.40).

Statistical analysis

Descriptive statistics and graphical methods were used to characterize the data: Pearson's chi square with a two-tailed test for significance was employed in order to test for differences between the pain and no-pain groups as well as gender differences. A multivariate forward logistic model adjusted for age, sex, financial status, living alone, education and comorbidity were performed. Analyses were carried out using the SPSS program, version 17.0. The probability values (p -values) are presented for statistically significant results. P -values of less than 0.05 were considered significant. Missing data are indicated by stating the number of participants (n) in all analyses.

Results

The mean age was lowest among both women and men who reported pain, but women were consistently older than men. In total, 769/1402 (54.8%) reported pain, of which 496/817 (64.5%) were women and 273/585 (35.5%) men, $p<0.01$.

The location of the worst pain (more than one possible) was distributed over seven groups, of which the legs (including feet) was the most frequently reported (Table I). Women experienced significantly more pain located in the vertebral column compared to men, $p<0.01$ (Table I).

On the VAS, the mean score among women was 5.50 (SD=1.94) and among men 5.19 (SD=2.00). The majority, 586/704 (83.2%), rated their pain as 4 or higher (moderate/severe), more women than men, 380/443 (86.0%) and 206/261 (79.0%), respectively ($p<0.02$) (Table II). Among men, pain intensity declines at older age (Pearson Chi Square 101.33, $p<0.01$). Among women, no difference in pain intensity was found with increasing age (Pearson Chi-Square 84.35, $p<0.38$).

Use of prescribed painkillers was reported by 283/478 (59.2%) women, compared to 128/263 (48.7%) men, $p<0.01$. Other treatment such as physiotherapy and heat/cold therapy was prescribed for 64/478 (13.4%) of the women and 24/263 (9.1%) of the men. A total of 128/263 (48.7%) of the men

Table I. Study of pain among older adults (60–96 years) from the SNAC-B study ($n=769$): worst pain area (%) and sex (more than one area is possible).

Worst pain	Total	Women	Men	P-value
Head	138/742 (18.6%)	93/481 (19.3%)	45/261 (17.2%)	0.48
Neck	253/751 (33.7%)	173/487 (35.5%)	80/264 (30.3%)	0.15
Vertebral column	445/755 (58.9%)	307/490 (62.6%)	138/265 (52.1%)	0.00
Joint	379/755 (50.2%)	253/488 (51.8%)	126/267 (47.2%)	0.22
Shoulder	363/754 (48.1%)	247/487 (50.7%)	116/267 (43.4%)	0.06
Leg	517/756 (68.4%)	339/489 (69.3%)	178/267 (66.7%)	0.45
Chest	130/751 (17.3%)	84/488 (17.2%)	46/263 (17.5%)	0.92

SNAC-B = Swedish National Study on Aging and Care – Blekinge.

Table II. Study of pain among older adults (60–96 years) from the SNAC-B study ($n=704$). Pain intensity estimated on a visual analogue scale (VAS).

Pain	Total	Women ($n=443$)	Men ($n=261$)
VAS 0.0–3.99	118/704 (16.7%)	63/443 (14.2%)	55/261 (21.1%)
VAS 4.0–6.99	401/704 (57.0%)	260/443 (58.7%)	141/261 (54.0%)
VAS 7.0–10.0	185/704 (26.3%)	120/443 (27.1%)	65/261 (24.9%)

Note: Among men, pain intensity declines at older age, Pearson Chi Square 101.33, $p<0.01$. Among women, no difference in pain intensity was found with increasing age, Pearson Chi-Square 84.35, $p<0.38$.

VAS 0.0–3.99 = mild pain; VAS 4.0–6.99 = moderate pain; VAS 7.0–10 = severe pain.

SNAC-B = Swedish National Study on Aging and Care – Blekinge.

received no treatment whatsoever for their pain compared to 177/478 (37.0%) of the women, $p<0.01$.

In a multivariate forward logistic regression model adjusted for age, gender, financial status, living alone, education and comorbidity, women yielded the highest OR [OR 1.94 (CI 1.51–2.49)] for pain followed by education [OR 1.32 (CI 1.01–1.72)], comorbidity [OR 1.24 (CI 1.13–1.35)] and belonging to the younger part of the older adult cohort [OR 1.17 (CI 1.05–1.30)].

Discussion

The aim of this study was to examine pain prevalence, intensity, location and management in an aging population from a gender perspective.

Although further research is required to elucidate the characteristics of geriatric pain, this study reveals that more than half of the older adults had pain and that it was more commonly reported by women than men, which is in line with earlier studies [17]. Most of the participants with pain (83%) rated the intensity as moderate/severe, which corresponds with previous studies among younger individuals [28]. Our results, with a high prevalence of pain among older adults and a strong influence of sex, as shown in the multivariate logistic model where women yielded the highest OR for pain, are also consistent with findings from a study conducted in the UK with similar age cohorts [17]. Women reported significantly more

pain in the vertebral column than men, but the most common location, for both sexes, was the legs. The high prevalence of multi-site pain and the predominance of women are in line with previous results [4], but the high prevalence of leg and feet complaints contrasts with findings from the USA [4].

Karibe et al. investigated young and middle-aged patients with myofascial temporomandibular disorders and found that pain intensity did not differ by age group [8], which contrasts with findings in the present study – pain intensity declines with age among men. Our study also reveals that the high pain intensity in the majority of older adults is comparable with the pain intensity reported by men and women with hip and knee osteoarthritis [28].

This study highlights the fact that the most common treatment offered to older adults is drugs, either as self-medication or prescription painkillers, despite the fact that the majority of complaints concerned pain in the lower extremities. Aging causes physiological changes that increase the risk of toxicity and, due to medication for other diseases, a higher risk of drug–drug interactions. The high cost of chronic pain in Sweden includes both healthcare and drugs [14]. The goal of pain management in older adults is to reduce pain, thus enabling freedom to manage daily living and leisure activities since pain is related to low quality of life [18]. Recovery, or even a lessening of the pain, may provide improved wellbeing and cost reduction. However, the most commonly prescribed

treatment is painkillers, perhaps because of lack of knowledge about available evidence-based treatments. Federman et al. found that older patients received poorer quality pain management [29]. They were more often prescribed non-steroidal anti-inflammatory drugs and, less frequently, opioids, compared to younger individuals who suffered from pain [29]. Pains have a strong relationship with low quality of life among elderly women [18] and it is time to apply strategies constructed on evidence-based knowledge of chronic pain when treating older adults. Personality traits and pain are related among the older adults [21] and ought to be considered, as well as sex differences, in the choice of offered treatment. Identifying appropriate treatment may also be hindered by inadequate assessment. Treatment initiated without assessment could be potentially dangerous at an older age. Regular reassessment to detect improvement, deterioration or complications is necessary. Pain management planning for an elderly individual requires an understanding of the patient's treatment goals and expectations, which are likely to change with older age, comorbidities as well as cognitive and functional status. Strategies must be developed to enable older people to become active partners in this process. Further research is required to develop and test the efficacy of age-tailored and sex-adjusted interventions.

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Paper II



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Observational study

Relationship between pain and Quality of Life—Findings from the Swedish National Study on Aging and Care—Blekinge study

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HIGHLIGHTS

- Pain has a strong relationship with low Quality of Life (QoL) among elderly women.
- Insomnia is associated with low QoL among men who suffer less from pain.
- A striking gender difference: elderly women suffer from pain, elderly men suffer from insomnia.

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ABSTRACT

Background and aims: The influence of pain as well as Quality of Life (QoL) varies in accordance with biological, social, psychological and existential factors. This study investigates the influence of such factors on the relationship between pain and QoL among older adults from a gender perspective.

Methods: The Swedish National Study on Aging and Care (SNAC-Blekinge) baseline sample comprised 1402 individuals aged 60–96 years, of whom 769 (55%) reported pain. The participants were invited by a letter to take part in the study, which was carried out by research staff in two sessions of three hour each. Participants gave informed consent and completed a questionnaire between the two sessions. The reason for non-participation was registered among subjects who declined the invitation. Pain and insomnia were self-reported. Data on age, gender and if living alone or not were collected from the questionnaire. Co-morbidity was obtained from electronic patients records for a period of up to two years prior to participating in the SNAC study. SoC was measured by a translated short form from the original twenty-nine question instrument. QoL was estimated using the HRQL Medical Outcome Study-Short Form (SF 12). In a model, pain, age, sex, insomnia, co-morbidity, living alone, sense of coherence (SOC), household economy, education and QoL were calculated through multivariate logistic regression. **Results:** Among women, pain was found to have the highest OR (odds ratio) for low QoL [OR 2.27 (CI 1.36–3.78)], followed by low economic status [OR 1.75 (CI 1.08–2.84)], co-morbidity [OR 1.24 (CI 1.05–1.46)], low SOC [OR 1.08 (CI 1.06–1.10)] and lower age [OR 1.05 (CI 1.02–1.08)]. In men, insomnia was found to be the main contributor to low QoL [OR 1.86 (CI 1.04–3.33)], followed by low SOC [OR 1.08 (CI 1.05–1.11)] and lower age [OR 1.04 (CI 1.01–1.07)].

Conclusions: Pain has a strong relationship with low QoL among elderly women. Insomnia is associated with low QoL among men who suffer less from pain. Thus the main result is a striking gender difference: Elderly women suffer from pain, elderly men suffer from insomnia.

Implications: It is important to take account of sex, age, sleep problems, co-morbidity, SOC and economic status in order to understand the relationship between pain and QoL among older adults.

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1. Introduction

Pain is an unpleasant sensory and emotional experience [1], which can lead to decreased Quality of Life (QoL) [2]. There is a higher prevalence of pain among older persons, especially women

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[3–5]. Although normal ageing does not necessarily influence QoL in a negative way [6], the higher prevalence of pain can be assumed to lead to a greater risk of low QoL in older people. Pain can be caused by biological, social, psychological and existential factors [2,7–10]. Therefore, these aspects should be further investigated and the knowledge gained taken into account when formulating guidelines for the treatment of older people with pain [11].

The quality of sleep may affect the relationship between pain and QoL in older people as inability to achieve restful sleep results in lower QoL [12]. While it is acknowledged that sleep architecture does not usually change with age [13,14], older people with pain have reported poorer sleep quality than those without pain [12,15,16]. Co-morbidity and need of health care may also contribute to lower QoL [17]. In addition, living alone has been associated with low QoL [8]. The perception of social support and anchorage rather than the actual number of relatives and friends is essential for a high sense of coherence (SOC), which is closely linked to QoL [18]. Moreover, socio-demographic and gender factors, such as unemployment and female sex, contribute to the perception of poor health and thereby low QoL in the population aged between 45 and 64 years [19]. Other areas identified as important for QoL are level of involvement, relationships, financial circumstances and health status [20,21]. Taking the above into account, we hypothesise that these factors also have an impact on the relationship between pain and QoL.

The aim of the study was to investigate the influence of biological, social, psychological and existential factors on the relationship between pain and QoL in women and men aged 60 years and over from a gender perspective.

2. Methods

2.1. Sample

The Swedish National Study on Aging and Care (SNAC) is a national, longitudinal, multicentre study based on a representative randomised sample of age-stratified older adults in ten age cohorts (60, 66, 72, 78, 81, 84, 87, 90, 93, 96-years). Individuals were randomly selected from the national Population Register. The data collection was conducted at four research centres and approved by the Ethics Committees of Lund University and the Karolinska Institutet, Stockholm, Sweden. The structure and design of the SNAC project have previously been presented by Lagergren et al. [22].

Participants in the present study were recruited from the SNAC baseline sample at one of the four research centres, SNAC-Blekinge (B) in Karlskrona. A total of 2312 individuals were invited to participate, of whom 1402 (61%) agreed. The response rate varied between 55 and 75% in the different age groups, with a higher rate in the younger groups. Thus a total of 910 subjects declined participation. Reasons for non-participation were lack of willingness (83%), feeling too ill (10%) and impossible to contact (7%). No statistical difference was found in terms of gender among the participants and dropouts. Data collection was carried out during the period 2001–2003. This sample of 585 men and 817 women is similar to the other rural and urban samples of the overall SNAC study in terms of age, sex, functional ability and perceived QoL. In 2001, the municipality of Karlskrona, a medium sized town with rural surroundings, had 60,596 inhabitants, of whom 30,389 were women and 30,207 men. The population >60 years was 14,627 (24.1%), of whom 8242 (56.3%) were women and 6385 (43.7%) men.

2.2. Procedure

Potential participants were invited by letter to take part in the study. Medical examination and testing by research personnel was

conducted in two sessions, each lasting about 3 h. Physicians and nurses were members of the research team and collected data from the medical examination, structured interview and questionnaire. Access to medical records and informed consent were obtained from each patient and the questionnaire was completed in the period between the two sessions. Those who agreed to participate but were unable to travel to the research centre were investigated in their home or nursing home.

2.3. Measures

Information on health related Quality of Life (HRQoL) was obtained by using the health survey short form (SF-12) as a dependent variable. The SF-12 instrument has been validated and provides a score estimate of an individual's health in eight dimensions: Physical functioning, Physical activity, Pain, General health, Vitality, Social functioning, Emotional capacity and Mental health [23,24]. The response alternatives to the twelve questions were 'Yes' or 'No' or in the form of 3, 5 or 6 statements. The scores were processed in accordance with the Swedish Manual and Interpretation Guide [23]. The physical component scores (PCS-12) and mental component scores (MCS-12) are obtained by means of the standard scoring algorithm provided by the designers of the instrument [25]. As the concept of pain partly overlaps the PCS-12 in the SF-12, the analyses were conducted using the MCS-12. The holistic approach and health perspective meant that high QoL was defined as the upper 25th percentile, corresponding to a cut-off point of 60.4. Participants in the lower 75th percentile were thus defined as having low QoL.

The independent variable pain was self-reported and based on the question: Have you had ache/pain during the last 4 weeks? The response alternatives were 'Yes' and 'No'.

Data on age, gender and living alone were collected from the questionnaire.

Sleep disturbances were addressed by the question: Do you suffer from insomnia? The response alternatives were 'Yes' and 'No'.

Co-morbidity was measured using the Johns Hopkins Adjusted Clinical Groups (ACG) Case Mix System 6.0. Special algorithms based on various diagnoses were used and validated [26,27]. The five criteria employed were: (1) likely persistence of the morbidity conditions in question, (2) their severity, (3) their aetiology, (4) their diagnostic certainty and (5) the person's need for special care. The individuals were then assigned to some of the 82 ACG groups with the same degree of co-morbidity but without measuring the individual's functional capacity. The diagnoses were obtained from electronic patient records for a period of up to two years prior to the SNAC study ($n = 1379$). The 82 ACG groups were then merged into six (0–5) groups, 0 indicating no need and 5 a great need of health care. The mean co-morbidity was 1.73 (s.d. 1.40).

SOC was measured by a translated short form of 13 questions from the original 29-question instrument, using the scoring algorithm provided by the designer [28]. There are 7 response alternatives and a score range of 1–100. As low, normal and high SOC is not defined, the mean score (72.23) was used. Thus scores below the mean were classified as low SOC, because it was considered to be normally distributed.

The economic status was based on whether or not the person had savings. A question from the Swedish statistics survey on income and living conditions was used: Could you, if necessary, raise 14,000 SEK (about 2000 USD) within a week for unexpected expenses? The response alternatives were 'Yes' and 'No' [29].

Educational level was measured by the question: Did you finish secondary school? The response alternatives were 'Yes' and 'No'.

Table 1
Demographic characteristics of the adults 60–96 years from the SNAC-B study ($n = 1402$), in total and gender wise, with and without pain.

Characteristic	Total	Women			Men		
	Population (n)	With pain	Without pain	p-Value	With pain	Without pain	p-Value
Individuals (n)		1402	496	321		273	312
Age years mean	76.7	76.6	79.2	0.02	74.7	76.0	0.14
QoL score, upper 25th percentile n	60.4	59.8	60.7	0.00	60.7	60.7	0.15
Insomnia	$n = 1128$ 414/1273 (32.5%)	$n = 421$ 234/493 (47.5%)	$n = 217$ 71/248 (28.6%)	0.00	$n = 246$ 70/209 (26.0%)	$n = 244$ 39/263 (14.8%)	0.00
Co-morbidity (3–5)	562/1379 (40.8%)	237/491 (48.3%)	108/312 (34.6%)	0.47	106/270 (39.3%)	111/306 (36.3%)	0.27
Living alone	587/1319 (44.5%)	284/496 (57.3%)	151/272 (55.5%)	0.64	68/273 (24.9%)	84/278 (30.2%)	0.16
SOC score mean	72.2/1212	70.4/457	73.5/234	0.12	71.4/264	75.2/257	0.02
Lack of cash margin	232/1248 (18.6%)	112/474 (23.6%)	48/244 (19.7%)	0.23	38/264 (14.4%)	34/266 (12.8%)	0.59
Low education	1150/1277 (90.1%)	443/447 (92.9%)	243/262 (92.7%)	0.95	232/267 (86.9%)	232/271 (85.6%)	0.67

Chi-square calculations showing differences between groups (p -value). SNAC-B, Swedish National Study on Aging and Care—Blekinge. Co-morbidity (3–5) indicating a strong need of health care. SoC, sense of coherence.

2.4. Statistical analysis

Descriptive statistics were used to characterise the data as well as the association between the independent variables and the dependent variable, QoL. Spearman's chi-square test was applied to control for differences between the 25% with the highest scores and those reporting scores in the MCS 75th. Multivariate logistic (forward) regression analyses were conducted separately for each sex to provide odds ratios (ORs) for the effect of the independent variables on the dependent variable and to study whether the relationship between pain and QoL changed when covariates were entered.

All analyses were carried out using the SPSS program, version 17.0. The probability values (p -value) revealed statistically significant results. The level of significance was set at 0.05. Missing data are indicated by (n) in all analyses. If a single question was missed the subject was excluded and reported as missing data.

3. Results

Pain was reported by 769 (54.8%) participants, 496 (64.5%) women and 273 (35.5%) men, $p < 0.001$. The participants who reported pain had a mean age of 76.0 years compared with a mean age of 77.6 years among the older adults without pain. Pain was not more common among the oldest old (>80 years) (340, 51.4%) than in the younger groups of older adults in the study population (60 to <80 years) (429, 58%), n.s.

Insomnia was reported by 304 (39.9%) in the pain group and by 110 (21.5%) of those without pain, $p < 0.001$ (Table 1).

Table 2a
Study of relation between pain and QoL among adults 60–96 years from the SNAC-B study ($n = 1402$): logistic forward regression models showing association of independent variables with low QoL among women ($n = 588$).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI
<i>Control variables</i>										
Pain	2.92***	1.87–4.57	2.63***	1.67–4.14	2.44***	1.49–3.98	2.18**	1.32–3.59	2.27**	1.36–3.78
Age (younger)	1.06***	1.04–1.08	1.06***	1.04–1.08	1.06***	1.03–1.08	1.05***	1.02–1.07	1.05***	1.02–1.08
<i>Biological variable</i>										
Insomnia			1.77**	1.20–2.60	1.42	0.94–2.16	1.43	0.94–2.17	1.40	0.92–2.13
<i>Social variables</i>										
Living alone					1.10	0.69–1.76	1.08	0.67–1.73	1.03	0.63–1.67
Low SOC					1.08***	1.06–1.10	1.08***	1.06–1.10	1.08***	1.06–1.10
<i>Co-morbidity</i>							1.25**	1.06–1.47	1.24*	1.05–1.46
<i>Economy variable</i>										
Lack of cash margin									1.75*	1.08–2.84
Low education									1.25	0.77–2.02

A high degree of co-morbidity (3–5) was reported by 562 participants (40.8%) and was more common among women, $p < 0.05$ (Table 1). The 237 women with pain (48.3%) reported higher co-morbidity compared to the 106 men with pain (39.3%), $p < 0.001$.

Of the individuals who reported pain, 352 (45.8%) were living alone. Corresponding figures for the group without pain were 235 (42.7%), n.s. (Table 1).

The mean SOC score was generally lower among women, while participants of both sexes who reported living with pain had lower scores (Table 1). A low economic status was reported by 160 women (22.3%) and 72 men (13.6%). A low educational level was reported by the majority of participants; 686 women (92.8%) and 464 men (86.2%) (Table 1).

The logistic regression analyses were performed using five steps for each sex (Tables 2a and 2b).

In model 1, pain was associated with a high OR for low QoL among women but not in men. Being younger was associated with an increased OR for low QoL among both women and men.

In model 2, insomnia seemed to reduce the OR for pain as the main factor causing low QoL among women, while the influence of age was about the same for both sexes. Insomnia yielded the highest OR for low QoL among men.

In model 3, the OR for women to experience low QoL if living with pain remained strong but with a tendency to decrease. Among men, insomnia remained the strongest predictor of low QoL. For both sexes, lower age and low SOC increased the OR slightly but significantly for low QoL.

In model 4, pain yielded the highest OR for low QoL, followed by co-morbidity among women. Co-morbidity did not increase the OR for low QoL among men and the relationship between

Table 2b

Study of relation between pain and QoL among adults 60–96 years from the SNAC-B study ($n = 1402$): logistic forward regression models showing association of independent variables with low QoL among men ($n = 461$).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI
<i>Control variables</i>										
Pain	1.62	0.99–2.65	1.52	0.92–2.50	1.18	0.70–2.01	1.17	0.68–2.00	1.18	0.69–2.01
Age (younger)	1.05 ^{***}	1.02–1.07	1.04 ^{**}	1.02–1.07	1.04 ^{**}	1.01–1.07	1.04 ^{**}	1.01–1.07	1.04 ^{**}	1.01–1.07
<i>Biological variable</i>										
Insomnia			1.91 [*]	1.10–3.32	1.84 [*]	1.03–3.28	1.83 [*]	1.02–3.26	1.86 [*]	1.04–3.33
<i>Social variables</i>										
Living alone					1.13	0.62–2.06	1.14	0.62–2.07	1.16	0.63–2.14
Low SoC					1.08 ^{***}	1.05–1.11	1.08 ^{***}	1.05–1.11	1.08 ^{***}	1.05–1.11
<i>Co-morbidity</i>										
							1.03	0.84–1.26	1.03	0.84–1.26
<i>Economy variable</i>										
Lack of cash margin									1.40	0.681–2.87
Low education									1.08	0.60–1.94

^{*} $p < 0.05$.

^{**} $p < 0.01$.

^{***} $p < 0.001$.

insomnia and low QoL remained stable. SOC and lower age had a stable relationship with low QoL in both sexes.

Model 5; in the final model for women, pain still yielded the highest OR [OR 2.27 (CI 1.36–3.78)] for low QoL followed by a low economic status [OR 1.75 (CI 1.08–2.84)], co-morbidity [OR 1.24 (CI 1.05–1.46)], low SOC [OR 1.08 (CI 1.06–1.10)] and lower age [OR 1.05 (CI 1.02–1.08)].

In the final model for men, the strongest OR for low QoL was found for Insomnia [OR 1.86 (CI 1.04–3.33)] followed by low SOC [OR 1.08 (1.05–1.11)] and lower age [OR 1.04 (1.01–1.07)], which relationships remained stable when the covariates were controlled for.

There are gender differences regarding the relationship between the covariates and QoL.

4. Discussion

This paper describes several factors that influence QoL among pain-reporting older adults. The main result is the gender difference, as pain had a significant impact among women but no influence among men.

With the exception of the gender difference, the findings remained stable when the covariates were controlled for. The findings are in line with previous results from Hawkins et al., who found pain to be the strongest factor in lowering the mental QoL among the older adults, although gender differences were not investigated [30]. It may be that psychosocial factors contribute to gender differences in pain sensitivity, as despite several years of laboratory research, no gender differences have been found [31,32]. In our opinion, another explanation for the fact that pain does not seem to influence QoL among men could also be cultural differences between the genders.

This study has shown that belonging to the younger group of older adults with pain has a negative influence on QoL. This result is in contrast to findings by Dominick et al. [33]. In their study, older age was associated with poorer Quality of Life if living with pain. One possible explanation for our findings is the consequences of pain on a psychological level, which is in line with research on a group of Turkish adults aged sixty five years or older, which indicated that adults living with pain had reduced physical and mental performance [34]. Activity patterns may differ between younger and older adults as well as expectations that pain is part of the ageing process, which may result in greater acceptance with age [35].

Another explanation, as suggested by Levasseur et al., could be the fact that most leisure, cultural and social activities take place away from home, which is often difficult [36].

It is notable that in earlier studies of this older adult population, about three quarters of those who reported insomnia also mentioned suffering from pain [5]. On the other hand, sleep disorders have previously been found to be associated with other co-morbidities in an ageing population [17,21]. In the present study the results demonstrate that insomnia influences the QoL of men, which corresponds with findings by Lee et al. [37]. According to Vonderholzer et al., one explanation could be the gender differences in sleep measures [38]. When suffering from pain, good quality sleep can be even more essential due to functional limitations caused by other co-morbidities. This study has revealed gender differences in the relationship between QoL and co-morbidities, which might also be explained by consequences on a psychological and/or cultural level.

Living alone contributes to a perception of low QoL in middle age [19]. Women living alone are more common in the present study, but among the older adults who reported pain it appeared that low SOC rather than living alone was the decisive factor. In contrast, Sherman et al. reported that 75 year old persons living alone, especially women, reported lower well-being than other groups of older adults [39]. Previous research has revealed that the ability to go out and take part in social life/leisure activities has the greatest impact in adults suffering from chronic illness [20,40]. On the other hand, this contradicts the findings by Bowling et al., who showed that the main factor is social relationships, followed by health and economic status, in terms of influencing QoL among people aged 65 years and over [21]. The results of our study reveal that SOC plays an important role in the QoL of both women and men who experience pain, irrespective of whether or not they live alone. One possible explanation for the different findings could be the composition of the study sample, i.e. selected patient groups or the general population, as in the present study.

When the present generation of older adults was younger, most families were supported by the husband's income, while the wife was responsible for the children and household. As a consequence, it is likely that the pension level at a later stage of life can explain why the financial situation is more important for women. On the other hand, education did not have any significant influence on the QoL of the older adults in our study, which contradicts the findings by Sherman et al. [35].

4.1. Limitations and strength

Some limitations should be mentioned. This cross-sectional study included older people from an urban area (a medium-sized town) with rural surroundings, so perhaps the results cannot be generalised to rural areas and big cities. However, the study population resembles the other rural and urban samples of the overall SNAC study in terms of age, sex, functional ability and perceived QoL.

In this study, the subjective experience of pain was self-reported and pertained to the four preceding weeks. The results do not reveal whether the reported pain was persistent or acute nor its intensity. As pain is an unpleasant sensory and emotional experience associated with or described in terms of actual or potential tissue damage, pain assessment may reveal an imbalance in the body, psyche or both. This cross-sectional study does not deal with the consequences in relation to activity or suggest pain-treatment and whether the latter could have an influence on the differences identified. However, the reported prevalence of pain among older adults and the gender difference where more women reported pain are consistent with findings from a study in the UK with similar age cohorts [41].

In the Swedish general population, the Mental component scores (MCS) of the health survey short form, SF-12, for the upper 25th percentile in the age groups 60–80 years and over were distributed between 57.9 and 59.3 with a standard deviation from 10.4 to 11.7 [33]. In our study, the age groups were divided into shorter intervals and extended to 96 years. As younger cohorts score lower on the MCS, the mean MCS-score in this study is considered representative. The strength of the study is the number of older individuals in the oldest-old cohorts. The material is consistent with similar studies from other parts of Europe in which several factors apart from health were important for QoL [3]. A British study of people aged 65 years and over living in their own homes revealed that social contacts are equally valuable as health [21]. Similar findings have been reported in a Canadian study of participants aged 60 years and over [39].

4.2. Conclusions

Pain has a strong relationship with low QoL among elderly women. Insomnia is associated with low QoL among men who suffer less from pain. Thus the main result is a striking gender difference: Elderly women suffer from pain, elderly men suffer from insomnia.

4.3. Implications

The aim of this study was to determine whether biological/psychological and social factors influence the relationship between pain and QoL among older adults. Extending life requires biological, psychological and social well-being in combination with an individual's will to live. There is an obvious necessity to satisfy the needs of the older section of the population and improve their perceived QoL. Our findings suggest that it is important for all healthcare professionals to take account of the fact that aspects other than pain and insomnia, for example co-morbidities, need to be highlighted during consultations.

The influence of biological, social, psychological and existential factors on the relationship between pain and QoL was studied in women and men aged 60 years and over from a gender perspective. There are gender-based differences in the population that are stronger among older adults with pain [4,5]. Our data indicate that pain, age and female sex in addition to social and psychological factors have an independent, negative effect on QoL. This suggests that each factor should be assessed, although in view of the ORs,

focus should be placed on pain and co-morbidity among women and insomnia in men.

The mortality rate of older people reporting dissatisfaction with their health has been found to be double that of people who do not report dissatisfaction [19]. The differences in mean age between the groups with and without pain indicate the need for future studies to investigate whether or not pain contributes to morbidity/mortality in the general population of older adults.

Conflict of interest

The authors declare that there is no conflict of interests.

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Paper III



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Clinical pain research

The influence of personality traits on perception of pain in older adults – Findings from the Swedish National Study on Aging and Care – Blekinge study

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HIGHLIGHTS

- Pain has a relationship with neuroticism among elderly women.
- In men, both neuroticism and openness are associated with pain.
- Both sexes suffer from insomnia.
- There is gender difference in the relationship between personality traits and pain.

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ABSTRACT

Background and aims: The experience of pain may vary in accordance with personality traits and individual characteristics. Neuroticism is demonstrated to constitute a vulnerability factor among younger and middle-aged pain patients. The combination of openness and neuroticism is associated with high anxiety/depression scores among adult individuals with chronic conditions. The aim of this study was to investigate possible associations between pain and the personality dimensions of neuroticism, extroversion, openness, agreeableness and conscientiousness among persons aged 60 years and older. An additional aim was to explore whether such associations are equally gender expressed.

Methods: The Swedish National Study on Aging and Care includes a randomly selected sample from the National Population Register. The data collection was conducted at four research centres and was approved by the Ethics Committees of Lund University and the Karolinska Institutet, Stockholm, Sweden. The Blekinge sample includes 1402 individuals, aged 60–96 years, of whom 769 (55%) reported pain. A total of 2312 individuals had been invited to participate. The reason for non-participation was registered. Participants underwent medical examination and testing by research personnel, conducted in two sessions, each of which lasted about 3 h. A questionnaire was completed between the two sessions. Pain was self-reported and based on the question: Have you had ache/pain during the last 4 weeks? Information on personality traits was obtained by means of the personality SGC1 questionnaire; a 60-item Swedish version of Costa & McCrae's FFM questionnaire. Personality traits were then tested based on gender by means of multivariate forward logistic regression in models adjusted for age, insomnia, financial status and educational level.

Results: When adjusting for covariates among women, neuroticism had a small but significant odds ratio of experiencing pain (OR 1.05, CI 1.02–1.08). Insomnia had the highest odds ratio (OR 2.19, CI 1.52–3.15) followed by low education (OR 1.59, CI 1.07–2.36), while belonging to the younger part of the older adult cohort was also associated with pain (OR 1.02, CI 1.005–1.04). In men, neuroticism (OR 1.03, CI 1.002–1.06) followed by openness (OR 1.03 CI 1.001–1.07) had a small but significant odds ratio of experiencing pain. Insomnia had the highest odds ratio (OR 1.98, CI 1.24–3.15).

Conclusions: Personality traits and pain were related among the older adults but there were gender differences. The relationship between pain and neuroticism in women was about the same in strength as the relation between pain and neuroticism/openness in men. Both sexes suffer from insomnia. The relationship between personality traits and pain was only affected to a minor extent by insomnia.

Implications: There is a need to increase awareness of the impact of personality as well as to provide improved treatment for pain and insomnia in older people.

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1. Introduction

The experience of pain is associated with tissue damage or described in terms of such damage [1]. As pain includes both sensory and emotional components, personality affects the experience of pain [2]. Research on twins suggests that the perception of pain is related to personality [3].

Personality factors have a greater influence on suffering than on pain intensity [4]. The ways individuals differ are summarized in the five factor theory of personality (FFT): Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A) and Conscientiousness (C) [5]. The FFT is a model for investigating the relationship between personality and health [6].

N represents the individual's tendency to feel nervous, worry and wish to avoid harm. Psychological distress has a strong association with N [7]. In adult fibromyalgia patients (24–62 years) N was found to have a strong connection with both pain catastrophizing and pain anxiety [8]. N is associated with unpleasantness but not with pain intensity [4].

E is characterized by being social and willing to enter into contact with others. In a study of adults aged 60 and over, this trait was reported to be high among the oldest old and, together with other factors, suggested as contributing to the rapidly increasing rate of very old people [9]. The study found associations between E and adaptation to the challenges of the oldest old [9]. Although the association between E and longevity has been discussed, no evidence has been found when comparing younger and older individuals as in the Health and Lifestyle survey [10].

Imagination, aesthetic sensitivity, attentiveness to inner feelings and intellectually curiosity is one description of the trait O, which has also been described as a source of life satisfaction after retirement [11]. Individuals with this trait wish for sensory stimulation, such as viewing art, listening to music, reading literature and poetry, as well as variety in everyday life. Individuals with a low score on this trait are considered conventional and traditional. The combination of O and N was found to be associated with high anxiety/depression scores among individuals with chronic conditions [12].

Individuals who have a high score on A usually have positive social interactions, cooperate well in groups and help others. A has been related to sadness in a study including both younger and older adults in the USA [13]. Another characteristic of A is the tendency to be compassionate, although A was found to be negatively related to distress in an interpersonal context in patients with low back pain [14].

Characteristics of trait C include competence, self-discipline and impulse control. This trait is often common among people with a healthy life-style, i.e. individuals who normally exercise and avoid excessive alcohol consumption and smoking. The use of Health Care, i.e. annual check-ups and compliance with doctors' advice, can to some extent explain the relationship between C and perceived health among the older adults [15]. Individuals who have a high score on C tend to be organized, a typical characteristic of this group being to-do lists. They tend to be happy with life and the C-trait is considered to have a positive relationship with subjective well-being. C is a predictor of longevity, even when adjusted for gender and educational level [16].

It has been suggested that personality traits influence psychosocial functioning in patients with pain. N was demonstrated to constitute a vulnerability factor, predisposing patients to greater fear of pain and higher pain severity [17]. Martinez et al. concluded that N and C were predictors of pain catastrophizing and that N, O, and A were significant predictors of pain anxiety [8]. Psychological treatment provides the same level of pain relief as surgery among low back pain patients with high N scores [18]. In the past decade, the FFT of personality has gained wide acceptance [19]. A

vulnerability model indicated an increase in the risk of N in individuals with low educational level [20]. Higher levels of E and C may be associated with a reduced risk of disability in old age [21].

Insomnia and age are associated with pain [22]. Financial status has been demonstrated to be associated with pain experience. Education is related to personality and could be assumed to be associated with pain [23]. In 2003 about 15.9% of adults in Sweden had studied at university level [24]. Insomnia has been shown to relate to quality of life (QoL) among men [22,25]. Women more often complain of insomnia but research has suggested that this may be caused by behavioural factors [26]. All types of insomnia are prevalent in the geriatric population [27]. Coping strategies vary according to personality trait, thus insomnia is assumed to be associated with personality [28].

The aim of the present study was to, in a gender perspective, investigate possible associations between perceived pain and the personality among persons aged 60 years and older.

2. Methods

2.1. Sample

Participants were recruited from the Swedish National Study on Aging and Care (SNAC), a national multicentre study following a representative randomized sample of older adults over time. Full details of the study structure, design, population and recruitment have been described by Lagergren et al. [29]. The SNAC baseline data collection was conducted in 2001–2003 as a longitudinal study of age-stratified older adults in various (10) age cohorts (60, 66, 72, 78, 81, 84, 87, 90, 93, 96 years). The SNAC is conducted at four research centres and approved by the Ethics Committees of the Medical Faculty at Lund University and the Karolinska Institutet, Stockholm, Sweden. Informed consent was obtained from each participant.

The present participants were recruited from the SNAC sample at SNAC-Blekinge (B) in Karlskrona, one of the four research centres. Karlskrona is a medium sized town with rural surroundings situated in south-eastern Sweden.

To obtain a representative sample of the population of older adults, 2312 subjects were contacted, of whom 1402 (61%) agreed to participate. Of the 910 subjects who declined to participate, 755 (83%) stated that they had no interest and 91 (10%) mentioned comorbidity (feeling too sick). An additional 64 (7%) subjects could not be contacted. The SNAC-B respondents ($n = 1402$), 585 men and 817 women, are considered representative of the geriatric Swedish population and resemble the other rural and urban sub-samples of the total SNAC study in terms of age, gender and functional ability [29].

2.2. Procedure

Potential participants were invited by letter to take part in the study. Those who agreed were tested every month during the data collection period, which comprised the 6 weeks before as well as after their birthday, in order to avoid systematically exceeding their nominal age. They also underwent medical examination and testing by research personnel, conducted in two sessions, each of which lasted about 3 h. The participants completed a questionnaire between the two sessions. The research personnel offered to carry out the investigation in the participants' homes if they were unable to travel to the research centre. A release form allowing access to medical records and informed consent were also obtained.

2.3. Measures

The independent variable pain was self-reported and based on the question: Have you had an ache/pain during the last 4 weeks? The response alternatives were 'Yes' and 'No'.

Pain intensity was based on self-estimation on a VAS-scale from 0 to 10 with millimetre intervals [30]. The pain intensity values were mild (VAS = 0–3.99), moderate (VAS = 4.00–6.99) and severe pain (VAS = 7.00–10.00).

Information on personality traits was obtained by means of the personality SGC1 questionnaire, a 60-item Swedish version of Costa & McCrae's FFM questionnaire [5]. The questions had seven response alternatives ranging from (1) completely disagree to (7) completely agree. The questions were then categorized (sometimes in reverse order in accordance with the instrument key) into the FFM traits (Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness). In the present study, the mean Cronbach Alfa for the SGC1 was 0.72 ($n = 0.81$; $E 0.77$; $O 0.58$; $A 0.62$; $C 0.80$).

Age and gender data were collected from the questionnaire.

Sleep disturbances were dealt with by the question: Do you regularly suffer from insomnia? The response alternatives were 'Yes' and 'No'.

The question regarding the financial situation, i.e. whether the person had savings or a low economic status was: If necessary, could you raise the sum of 14,000 SEK (about 2000 USD) for unexpected expenses within one week? The response alternatives were 'Yes' and 'No'. The question used in the SNAC database concerning the participants' financial situation was based on a Swedish survey on income and living conditions [24].

Educational level was measured based on the question: Which educational level have you attained? to be answered by: Did you finish secondary school? The response alternatives were 'Yes' and 'No'.

2.4. Statistical analysis

Descriptive statistics were used to investigate the distribution of the included variables. The tests were based on gender. A backward multivariate logistic regression was performed to find out whether or not personality traits were related to pain. This was followed by a forward multivariate logistic regression to obtain odds ratios (OR) in order to investigate whether personality traits are associated with pain among older adults, adjusted for age, insomnia, financial situation and education. Five steps were performed. In step one, odds ratio for personality trait(s) was calculated. Step two included age. Step three involved insomnia. Step four covered the financial situation and the final step comprised education. To evaluate the goodness of fit of the logistic regression model the Nagelkerke R square coefficient was calculated. All analyses were carried out using the SPSS programme, version 17.0. Probability values (p -value) of less than 0.05 were considered significant. Missing data are denoted (n) in all analyses.

3. Results

Pain was reported by 769 (54.8%) individuals, 496 (64.5%) women and 273 (35.5%) men ($p < 0.001$). Pain intensity was reported by 704 individuals, 443 (89.3%) women and 261 (95.6%) men and distributed as follows; women: mild 63 (14.2%); moderate 260 (58.7%); severe 120 (27.1%) and men: mild 55 (21.1%); moderate 141 (54.0%); severe 65 (24.9%).

Mean age in the group of women reporting pain was 76.6 years compared to the group of women with no pain who had a mean age of 79.2 years ($p < 0.003$). Men reporting pain had a mean age of 74.7 years compared to 75.9 years for those without pain.

Insomnia was reported by 304 (39.9%) in the pain group and by 110 (21.5%) of those without pain ($p < 0.001$). Women with pain, 234/493 (47.5%), most commonly reported insomnia followed by women without pain, 71/248 (28.6%). Among men, the corresponding figures were 70/209 (26.0%) and 39/263 (14.8%).

Table 1a

Study of the relationship between pain and personality among adults 60–96 years from the SNAB-B study ($n = 1402$): logistic backward regression models illustrating the association between personality traits and pain in women ($n = 696$).

Trait	Odds ratio	p -Value	95% confidence interval
Neurotic	1.05	0.00	1.03–1.08
Extraversion	0.99	0.76	0.96–1.03
Openness	1.01	0.71	0.98–1.04
Agreeableness	1.01	0.53	0.98–1.04
Conscientiousness	1.00	0.96	0.97–1.03
Constant	0.23	0.92	

Nagelkerke R square 0.042.

SNAC-B, Swedish National Study on Aging and Care – Blekinge.

Table 1b

Study of the relationship between pain and personality among adults 60–96 years from the SNAB-B study ($n = 1402$): logistic backward regression models illustrating the association between personality traits and pain in men ($n = 522$).

Trait	Odds ratio	p -Value	95% confidence interval
Neurotic	1.03	0.04	1.002–1.07
Extraversion	0.97	0.10	0.94–1.005
Openness	1.04	0.02	1.005–1.08
Agreeableness	1.00	0.87	0.96–1.04
Conscientiousness	1.02	0.34	0.98–1.05
Constant	0.18	0.17	

Nagelkerke R square 0.027.

SNAC-B, Swedish National Study on Aging and Care – Blekinge.

Among women, N was associated with pain (OR 1.05, CI 1.03–1.08) (Table 1a). In men, both N (OR 1.03, CI 1.002–1.07) and O (OR 1.04, CI 1.005–1.08) were associated with pain (Table 1b). No relationship between personality traits and pain intensity was detected (n.s.).

Significantly related personality traits were then tested based on gender by means of multivariate forward logistic regression in models adjusted for age, insomnia, financial status and educational level (Tables 2a and 2b).

In model 1, the strength of association between pain and the traits was about the same for women and men. In women, the trait N was associated with pain (OR 1.06, CI 1.03–1.09). In men, both the trait N (OR 1.04, CI 1.01–1.06) and O (OR 1.04, CI 1.001–1.07) were associated with pain.

In model 2, no association with younger age was found for either men or women.

In model 3, the OR for N remained weak but significant for both sexes. In women, insomnia had the highest odds ratio for pain (OR 2.18, CI 1.52–3.12) followed by N (OR 1.05, CI 1.03–1.08) and younger age (OR 1.02, CI 1.001–1.04). In men, the OR for insomnia was (OR 1.99, CI 1.25–3.16) followed N (OR 1.03, CI 1.002–1.06) and O (OR 1.03, CI 1.001–1.07).

In model 4, no association with low economic status was found for either men or women and no changes in relationship between pain and personality traits, age or insomnia was noted.

In model 5, in the final model for women, insomnia still yielded the highest odds ratio for pain (OR 2.19, CI 1.52–3.15) followed by low educational level (OR 1.59, CI 1.07–2.36). The trait of N (OR 1.05, CI 1.02–1.08) and belonging to the younger group of older adults (OR 1.02, CI 1.005–1.04) remained stable. A strained financial situation was not significantly related to pain (Table 2a).

In the final model for men, insomnia was found to have the highest odds ratio for pain (OR 1.98, CI 1.24–3.15) followed by the traits of N (OR 1.03, CI 1.002–1.06) and O (OR 1.03, CI 1.001–1.07). Belonging to the younger group of older adults, having a strained financial situation and low educational level were not significantly related to pain. The relationship between personality traits and pain was only affected to a minor extent by insomnia (Table 2b).

Table 2a

Study of the relationship between pain and personality among adults 60–96 years from the SNAC-B study, ($n = 1402$): logistic forward regression models illustrating the association between independent variables and personality in women ($n = 643$).

Control variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Neuroticism	1.06	1.03–1.09	1.06	1.04–1.09	1.05	1.03–1.08	1.05	1.03–1.08	1.05	1.02–1.08
Age (younger)			1.02	1.00–1.03	1.02	1.001–1.04	1.02	1.001–1.04	1.02	1.005–1.04
Insomnia					2.18	1.52–3.12	2.17	1.51–3.12	2.19	1.52–3.15
Low economic status							1.14	0.74–1.74	1.09	0.71–1.68
Low educational level									1.59	1.07–2.36

Nagelkerke R square 0.10.

SNAC-B, Swedish National Study on Aging and Care – Blekinge.

4. Discussion

This study adds to knowledge of pain in the elderly population and suggests that older adults with pain may share particular personality traits. The relationship between pain and personality seems to be equally strong among both sexes, although different traits are present in women and men. The result indicates about the same strength of association between pain and the trait of N in women and between pain and the traits of N and O among men. However, the OR values regarding personality traits are statistically significant but generally very low in the older population compared with younger pain patients [7,8]. Therefore, interpretation of the results should be made with care. It is important to bear in mind that a personality trait is a multi-dimensional construct and although attempts have been made to classify human beings into stereotypical categories, "The Big Five" traits only reveal the dominant facet of an individual's personality [5]. However, this population-based study highlights that personality traits were significant although marginally related to pain both in the female and the male group. Could it be that our findings can be explained by the ageing process? Nevertheless, a small but significant relationship to traits may help to predict different aspects of pain among older adults.

Some limitations should be mentioned. Fishbain et al. pointed out that certain trait tests and inventories may not be independent of pain state, as trait scores can change in line with pain treatment [31]. Despite the fact that adherence rates, such as adherence to medication, in women and men are very similar, some differences exist and women are slightly less adherent in following specific recommendations [32]. In this cross-sectional study it

was not possible to predict changes in trait scores as a result of treatment. Another limitation is that the subjective experience of pain was self-reported and restricted to the four preceding weeks. The results do not reveal whether the reported pain was persistent or acute. However, the strength with the question is that it was used in other European studies of older adults [33]. The size of the sample can be discussed, but the strength of this population-based randomized study lies in the proportion of older people in the oldest old groups. As a goodness of fit of the models used, the Nagelkerke value was used. Nagelkerke value is higher, (10%), among women compared to men (5%). Even though R -squared is small it has information value. Since personality traits could be considered as a weak signal in the presence of a lot of other factors influencing the experience of pain even a weak signal could be informative. Since neuroticism is so clearly associated with other factors related to pain and the relationship is stronger among younger adults these results will raise two questions: (1) Do older people suffer from a different type of pain than younger adults? (2) Is more state like measures, i.e. pain catastrophizing stronger associated with personality traits among older adults?

Pain is common among older people and the majority suffers from insomnia [22,26]. The gender-based differences in the elderly population are reinforced among those with pain [34,35]. The youngest women in this study had marginally higher odds values for pain, which difference was statistically significant. This is in line with a previous study of QoL among older adults living with pain [33], but contrasts with findings by Rustoen et al. who compared older with middle-aged adults [34]. Our results demonstrate that insomnia has the strongest association with pain and the

Table 2b

Study of the relationship between pain and personality among adults 60–96 years from the SNAC-B study, ($n = 1402$): logistic forward regression models illustrating the association between independent variables and personality in men ($n = 490$).

Control variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Neuroticism	1.04	1.01–1.06	1.04	1.01–1.06	1.03	1.002–1.06	1.03	1.001–1.06	1.03	1.002–1.06
Openness	1.04	1.001–1.07	1.04	1.001–1.07	1.03	1.001–1.07	1.03	1.001–1.07	1.03	1.001–1.07
Age (younger)			1.00	0.98–1.02	1.00	0.98–1.02	1.00	0.98–1.02	1.00	0.98–1.02
Insomnia					1.99	1.25–3.16	2.00	1.26–3.18	1.98	1.24–3.15
Low economic status							1.17	0.68–2.03	1.17	0.68–2.03
Low educational level									1.31	0.84–2.04

Nagelkerke R square 0.05.

SNAC-B, Swedish National Study on Aging and Care – Blekinge.

highest odds ratio. Traits were only marginally decreasing when adjusted for insomnia. Van de Laar et al. discussed whether personality factors play a causal role in the development of insomnia as they found a common trend among insomniacs to exhibit the trait of neuroticism [28].

Neither financial status nor educational level was found to have any relationship with pain among men. Educational level seems to be related to pain among older women. This is in contrast with findings from the MultiCare Cohort Study of patients aged 65 years and older where pain-related morbidity was equally distributed across age and socio-economic groups [35]. More studies are needed to investigate whether or not personality traits influence the incidence of pain and recovery rate from pain. Another interesting question is whether or not personality is a contributory factor to morbidity/mortality among individuals living with pain. Despite the fact that personality seems fairly stable across the lifespan, there is a lack of studies focusing on personality and its association with pain among older adults. Assessment of personality traits may be clinically important and contribute to a deeper understanding of how to manage older adults suffering from pain, thus contributing to diversity in successful ageing/longevity. However, since the relationship with personality traits is much weaker among older than younger adults, further studies are needed regarding if state like measures as pain catastrophizing, could be stronger associated with personality traits.

5. Conclusions

Neuroticism has a relationship with pain among elderly women. Neuroticism and openness have a relationship with pain among elderly men. Insomnia is associated with pain among both women and men. Thus the main result is a gender difference: pain has a stable relationship with neuroticism in both sexes, but also a relation with the personality trait openness among older men.

6. Implications

There is a need to increase awareness of the impact of personality as well as to provide improved treatment for pain and insomnia in older people.

Conflicts of interest

No conflicts of interest are declared.

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Paper IV



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