



TOM SAARIAHO

# Chronic Pain, Depressiveness and Pain Disability

The role of Early Maladaptive Schemas  
among Finnish pain patients  
and a control sample



ACADEMIC DISSERTATION

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ACADEMIC DISSERTATION

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*'Chronic pain is a state of continuous learning with reduced opportunity for forgetting'*

an adaptation from Apkarian et al. (2011)

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# LIST OF ORIGINAL PUBLICATIONS

The dissertation is based on the following original publications, which are referred to in the text by Roman numerals I-V.

I           Saariaho T, Saariaho A, Karila I and Joukamaa M (2009): The psychometric properties of the Finnish Young Schema Questionnaire in chronic pain patients and a non-clinical sample. *J Behav Ther Exp Psychiatry* 40 (1):158–168.

II           Saariaho T, Saariaho A, Karila I and Joukamaa M (2010): Early maladaptive schemas in Finnish adult chronic male and female pain patients. *Scand J Pain* 1(4): 196-202.

III           Saariaho T, Saariaho A, Karila I and Joukamaa M (2011): Early maladaptive schemas in Finnish adult chronic pain patients and a control sample. *Scand J Psychol* 52(2): 146-153.

IV           Saariaho T, Saariaho A, Karila I and Joukamaa M (2011): Early maladaptive schema factors, chronic pain and depressiveness; a study with 271 chronic pain patients and 331 control participants. *Clin Psychol Psychother* DOI: 10.1002/cpp.737.

V           Saariaho T, Saariaho A, Karila I and Joukamaa M (2011): Early maladaptive schema factors, pain intensity, depressiveness and pain disability: an analysis of biopsychosocial models of pain. *Disabil Rehabil* DOI: 10.3109/09638288.2011.638031.

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## ABBREVIATIONS

ACC	anterior cingulate cortex
AXIS I	clinical mental syndromes, e.g. depression, schizophrenia, social phobia.
AXIS II	personality disorders and intellectual disabilities
BDI	Beck Depression Inventory
BDI-II	Beck Depression Inventory-second edition
BDIPSY	cognitive-affective factor of Beck Depression Inventory
BDISOM	somatic-performance factor of Beck Depression Inventory
CBT	cognitive behavioural therapy
CFA	confirmatory factor analysis
CFI	Comparative Fit Index
CNS	central nervous system
CPSS	Chronic Pain Self-Efficacy Scale
CRPS	complex regional pain syndrome
DePro	detached protector mode
DLPFC	dorsolateral prefrontal cortex
DSM-III	Diagnostic and Statistical Manual of Mental Disorders – 3 <sup>rd</sup> edition
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders – 4 <sup>th</sup> edition
DWLS	Diagonally Weighted Least Squares
EFA	exploratory factor analysis
EMS	early maladaptive schema
EMSQ-R	early maladaptive schema questionnaire-research version
FM	fibromyalgia
GLS	general least squares
IASP	International Association for the Study of Pain
IC	insular cortex
LBP	low back pain
LOC	locus of control
MAIC	Minimum Akaike Information Criterion
ML	Maximum Likelihood
NFI	Normed Fit Index



PAG	peri-aqueductal grey
PCA	principal component analysis
PD	personality disorder
PDI	Pain Disability Index
PDS	Pain Disability Scale
PFC	prefrontal cortex
PLOC	Pain Locus of Control Scale
PSEQ	Pain Self-Efficacy Questionnaire
PTSD	post-traumatic stress disorder
RMSEA	Root Mean Square Error of Approximation
SCID	Structured Clinical Interview for DSM-IV
SF	schema factor
SFT	Schema-Focused Therapy
SI	primary somatosensory cortex
SII	secondary somatosensory cortex
SRMR	Standardized Root Mean Square Residual
TMD	temporomandibular joint disorder
VAS	Visual Analogue Scale
VLPFC	ventrolateral prefrontal cortex
WLS	Weighted Least Squares
YSQ	Young Schema Questionnaire

## ABSTRACT

Acute and chronic pain are two different entities. The intensity of acute pain is closely associated with tissue damage. Chronic pain, i.e. pain lasting three months or more, is associated with early adversities, emotional distress, depressiveness, catastrophizing and helplessness beliefs, social exclusion and job dissatisfaction. There is a 'chicken-and-egg' type of question: Is the depressive symptomatology present before or after the onset of pain. The traditional biomedical model of pain has not managed to offer a method to cure chronic pain. In recent decades the biopsychosocial model of pain has guided us from pain as sensation produced by injury toward the concept of pain as a multidimensional experience. The aim of the present dissertation was to study the connection between early, mainly emotional adversities, chronic pain, depressiveness and pain disability.

The dissertation is part of a larger study entitled 'the survey of the psychic profile of pain patients'. The data was collected from January 2004 to March 2005. The pain patients (N=271) in the study were chronic, first-visit pain patients in six pain clinics in central and northern Finland and the control participants (N=331) were municipal employees of Raahe town administration. The study method used was a cross-sectional questionnaire and also interviews. The existence of early adversities was estimated with the Young Schema Questionnaire-short form-Finnish version (YSQ-S2-extended), which was developed to measure 18 early maladaptive schemas (EMS).

The internal consistency of the YSQ-S2-extended was adequate to high in both samples and the groups showed equal goodness-of-fit statistics in CFA. For the first time the hypothesized 18 EMS structure of YSQ was confirmed in the total sample. The results supported the use of the Finnish version of YSQ among chronic pain patients. Of the chronic pain patients, 58.3% scored EMSs as meaningful, reflecting that the schema was active. Those pain patients with meaningful EMSs had significantly higher pain intensity, duration of pain and pain disability. The two most commonly occurring EMSs were Unrelenting Standards/Hypercriticalness (US) and Self-Sacrifice (SS) EMSs. The behaviour induced by them exacerbated the pain situation according to the interview study. Emotional Deprivation EMS predicted pain disability as much as did pain intensity and the number of pain sites in chronic pain patients. When the two samples were compared, pain patients showed higher scoring in EMSs reflecting incapacity to perform independently, catastrophic beliefs and pessimism. From the pain variables, pain disability showed the widest variation in EMS activity, but only in pain patients. The most severely disabled chronic pain patients showed an increase in Abandonment/Instability, Mistrust/Abuse, Emotional Deprivation, Defectiveness/Shame and Social

Isolation/Alienation EMSs. This supports the idea that severely disabled chronic pain patients suffer from early emotional maltreatment. To uncover the possible psychic patterns of chronic pain patients, the EMS data was subjected to exploratory factor analysis (EFA). The chronic pain patient group showed two schema factors (SF), whereas a three-factor structure was found in the control sample. In pain patients, the first and larger SF1 (*'Loser'*) showed a shameful, defective, socially isolated, failure, emotionally inhibited, deprived, submissive and resigned pattern, which had a strong association ( $r=.72$ ) with their depressiveness. The SF2 (*'Encumbered'*) showed a demanding, approval seeking, self-sacrificing and punitive pattern. The SF2 and the active SS and US schemas reflected cognitive-emotional structures of the same kind which propelled them to a behaviour which exacerbated their pain disease. The data of both the chronic pain patients and painful control participants (N=271) supported a biopsychosocial pain model where SFs predicted depressiveness and both depressiveness and pain intensity predicted pain disability, which was the 'end state'. However, the models differed in the direction of the path between pain intensity and depressiveness – depressiveness predicted pain intensity and vice versa, in the pain patient and control samples respectively. The effect size of depressiveness was approximately 11 times the effect size of pain intensity on pain disability in the pain patients. Among the controls, the effect size of pain intensity was 5.6 times the effect size of depressiveness on pain disability. When the duration of pain was more than two years, depressiveness became the sole predictor of pain disability among the chronic pain patients.

Childhood adversities have a lifelong effect on wellbeing and illness. This study highlights the consequences of early maladaptive schemas in chronic pain and its associate; depression. They both markedly impair quality of life. Schema-focused therapy may offer a special tool to help chronic pain patients.

## TIIVISTELMÄ

Äkillinen ja pitkäaikainen kipu ovat kaksi erillistä itsenäistä kokonaisuutta. Äkillisen kivun voimakkuus liittyy hyvin kudosvaurion laajuuteen. Krooninen kipu eli kipu, joka on kestänyt kolme kuukautta tai enemmän, on yhteydessä esimerkiksi varhaisiin vahingollisiin lapsuuden kokemuksiin, tunneperäiseen tuskaan, masentuneisuuteen, katastrofointi- ja avuttomuususkomuksiin, sosiaaliseen eristäytymiseen ja työtyytymättömyyteen. Tähän liittyy *'kumpi on ensin, muna vai kana'* –tyyppinen kysymys: onko masentuneisuusoireisto läsnä ennen kipua vai kivun alkamisen jälkeen. Kivun perinteinen biolääketieteellinen malli ei ole kyennyt tarjoamaan pitkäaikaista kipua parantavaa hoitoa. Viime vuosikymmenten aikana kivun biopsykososiaalinen malli on johdattanut meidät siitä oletuksesta, että kipu on vamman tuottama tuntemus siihen ajatukseen, että kipu on moniulotteinen kokemus. Tämän väitöstutkimuksen pyrkimyksenä oli selvittää varhaisten, pääasiassa tunneperäisten vastoinkäymisten yhteyttä pitkäaikaiseen kipuun, masentuneisuuteen ja kivun aiheuttamaan haittaan.

Väitöstutkimus on osa laajempaa tutkimuskokonaisuutta, jonka nimenä on *'Kipupotilaiden psyykkisen profiilin kartoitus'*. Tutkimusaineisto kerättiin tammikuun 2004 ja maaliskuun 2005 välisenä aikana. Tutkimuksen kipupotilaat (N=271) olivat pitkäaikaiskipupotilaita, jotka tulivat ensimmäiselle kipupoliklinikkakäynnilleen kuudelle eri kipupoliklinikalle Keski- ja Pohjois-Suomessa. Vertailuaineisto muodostui Raahen kaupungin kuntatyöntekijöistä (N=331). Tutkimusmenetelmä oli poikkileikkaustutkimus, mihin liittyi haastattelu ja kyselyjä. Varhaisen vahingollisen lapsuuskokemuksen olemassaoloa arvioitiin suomenkielisellä Young Schema Questionnaire –kyselyllä (YSQ-S2-extended), joka on kehitetty mittaamaan 18 varhaista maladaptiivista eli haitallista skeemaa.

YSQ-S2-extended –kyselyn sisäinen johdonmukaisuus oli riittävä kummassakin ryhmässä ja ryhmien tilastolliset mallien sopivuustestit vastasivat toisiaan konfirmatorisella faktorianalyysillä mitattuina. Oletettu 18 varhaisen maladaptiivisen skeeman (EMS) malli voitiin osoittaa ensimmäistä kertaa kokonaisaineistolla. Tulokset tukivat suomenkielisen YSQ –kyselyn käyttömahdollisuutta pitkäaikaisesta kivusta kärsivillä potilailla. Heistä 58,3%:lla oli kohollaan oleva varhainen maladaptiivinen skeemaa, joka antoi viitteen siitä, että skeema oli aktiivinen. Potilaat, joilla oli aktiivinen ja siis kohollaan oleva skeema, kokivat merkitsevästi voimakkaampaa kipua, heidän kipunsa oli kestänyt kauemmin ja heidän kipunsa aiheuttama haitta oli suurempi. Vaativuuden/ylikärittisyyden (US) ja uhrautumisen (SS) -skeemat esiintyivät yleisimmin.

Haastattelututkimuksen perusteella ne johtivat käyttäytymiseen, joka hankaloitti heidän kiputilaansa. Tunnevaje–skeema ennusti kipupotilailla kivun aiheuttamaa haittaa yhtä paljon kuin kipupaikkojen lukumäärä ja kivun voimakkuus. Vertailtaessa tutkimusaineistoja keskenään, huomattiin, että kipupotilaat arvioivat voimakkaammaksi skeemoja, jotka viittasivat katastrofijatuksiin, pessimismiin ja kyvyttömyyteen toimia itsenäisesti. Ainoastaan kipupotilailla ilmeni, että kivun aiheuttaman haitan voimakkuuteen liittyi suurin skeemavaihtelu. Voimakkainta kivun aiheuttamaa haittaa kokevilla kipupotilailla esiintyi nousua hylkääminen/epävakaisuus, epäluottamus/hyväksikäyttö, tunnevaje, vajavuus/häpeä ja sosiaalinen eristäytyminen/vieraantuminen -skeemoissa. Tämä tukee ajatusta, että vaikeinta kivun aiheuttamaa haittaa kokevat krooniset kipupotilaat kärsivät varhaisesta tunneperäisestä kaltoinkohtelusta. Kipupotilaiden skeema-arvoille suoritettiin eksploratiivinen faktorianalyysi, jotta mahdollisia psyykkisiä 'henkilötyyppejä' voitaisiin havaita. Kipupotilailla ilmeni kaksi ja verrokkiaineistolla kolme skeemafaktoria. Kipupotilaiden ensimmäinen ja suurempi skeemafaktori (*'Häviöjä'*) ilmensi häpeällistä, puutteellista, sosiaalisesti eristäytynyttä, epäonnistunutta, tunneperäisesti estynyttä, vaillejäänyttä ja alistunutta 'henkilötyyppiä', joka yhdistyi voimakkaasti ( $r=0,72$ ) heidän masentuneisuuteensa. Toinen skeemafaktori (*'Raataja'*) kuvasti vaativaa, hyväksyntää hakevaa, uhrautuvaa ja rankaisevaa 'henkilötyyppiä'. Tämä skeemafaktori sekä uhrautuminen- ja vaativuus/ylikriittisyys skeemat viittasivat samankaltaiseen tiedollis-tunneperäiseen rakenteeseen, joka johti kipusairautta pahentavaan käyttäytymiseen. Sekä kipupotilailla että kipeillä verrokeilla (N=271) tutkimusaineisto viittasi samankaltaiseen kipumalliin, jossa skeemafaktorit ennustivat masentuneisuutta, ja sekä masentuneisuus että kivun voimakkuus ennustivat kivun aiheuttamaa haittaa, joka oli 'päätepiste'. Mallit erosivat kuitenkin toisistaan masentuneisuuden ja kivun voimakkuuden välisen polun suunnassa – masentuneisuus ennusti kivun voimakkuutta kipupotilailla ja tilanne oli päinvastainen verrokeilla. Kipupotilailla masentuneisuus vaikutti 11-kertaa enemmän kuin kivun voimakkuus ja verrokeilla kivunvoimakkuus vaikutti 5,6 kertaa enemmän kuin masentuneisuus kivun aiheuttamaan haittaan. Kun kivun kesto oli jatkunut yli kahden vuoden ajan, masentuneisuudesta tuli yksinomainen kivun aiheuttamaa haittaa ennustava tekijä kipupotilasaineistossa.

Lapsuudenaikaisilla traumaattisilla kokemuksilla on pitkäaikaiset vaikutukset hyvinvointiin ja sairastavuuteen. Tämä tutkimus korostaa varhaisten haitallisten skeemojen seurauksia kroonisessa kivussa ja sen seuralaisessa, masennuksessa. Molemmat aiheuttavat huomattavan elämän laadun heikkenemisen. Skeematerapia voi tarjota erityistä apua kroonisten kipupotilaiden hoitomenetelmänä.

# 1. INTRODUCTION

*‘Chronic pain is a demoralizing situation’* (Turk and Monarch 2002, p. 3) as it not only creates stress by pain but also many ongoing difficulties that compromise all aspects of the patient’s life. No treatment is currently available that consistently and permanently alleviates the pain of all those afflicted. Contrary to acute pain, it seems that chronic pain does not have a sensible function. *‘A growing body of evidence indicates that the neurobiological mechanisms of acute and chronic pain differ substantially at all levels of the neuraxis including the brain’* (Wiech et al. 2005, p. 59). The experience of chronic pain can both arise from an interdependent set of biomedical, psychosocial and behavioural factors and in its turn affect these biopsychosocial factors (Turk 1996, Finestone et al. 2008). The prevalence of chronic moderate to severe pain in European residents varies from 12% in Spain to 30% in Norway being 19% in Finland (Breivik et al. 2006).

The prevalence of depression in Europe is estimated to range from 3% to 10% (Wittchen and Jacobi 2005) being 6.5% in Finnish adult population (Pirkola et al. 2005). Chronic pain is associated with depression. The prevalence of pain among depressive patients ranges between 5% and 100% and the prevalence of major depression with chronic pain varies 1.5% - 100% according to the context (population survey, primary care, pain clinic; Gambassi 2009). The causality and temporal association of pain and depression have been a focus of numerous studies and the question still seems to lack a definitive answer (Fishbain et al. 1997, Currie and Wang 2005). Both chronic pain and depression have been shown to generate disability, which is a major cause of incapacity for work and early retirement (e.g. Tian et al. 2005).

Young’s (1990) schema-focused therapy (SFT) is based on early maladaptive schemas (EMS), which refer to dysfunctional cognitive frameworks developed primarily in childhood. These patterns may support survival in youth and the nuclear family but later in adult life turn out maladaptive (Young et al. 2003). The origins of maladaptive schemas are, for example, in lack of support, understanding and affection (Emotional Deprivation EMS), maltreatment (Mistrust/Abuse EMS), rejection (Abandonment/Instability EMS) (Young 1999). There are 18 EMSs grouped into five hypothesised schema domains (Young et al. 2003). Every domain represents one important part of the core needs of the child. EMSs and schema domains are associated with a vast spectrum of disorders and psychopathology such as personality disorders (e.g. Reeves and Taylor 2007, Specht

et al. 2009), eating disorders (Anderson et al. 2006, Leung and Price 2007), depression (Waller et al. 2001, Harris and Curtin 2002, Baranoff et al. 2006), occupational stress (Bamber and McMahon 2008) and suicidality (Dutra et al. 2008). EMSs have not been measured among ‘medical’ disorders.

Medically explained and unexplained physical symptoms are associated with childhood maltreatment (Arnow 2004). Depression and chronic pain are connected to early adversities. Physical, sexual and emotional abuse in childhood has been shown in numerous studies to be associated with chronic pain in adulthood (e.g. Sansone et al. 2006, Thomas et al. 2006, Hu et al. 2007). Depressiveness has also been associated with such adversities (e.g. Aguilera et al. 2009, Karevold et al. 2009, Rubino et al. 2009). EMSs would serve as a measure for early adversities.

The structural equation modelling (SEM), path-analysis and hierarchical regression analysis studies of pain models have in cross-sectional and longitudinal designs supported pain intensity (e.g. Covic et al. 2003), pain disability (e.g. Arnstein 2000) and depression (e.g. Esteve et al. 2007) as the ‘end states’. To the best of my knowledge, the role of early maltreatment or emotional adversities has not been addressed in any of these studies.

In the pain clinic, pain patients are often confused with their situation and the ‘atmosphere’ is demoralized. Thus this study started in 2004 from an interest in studying the ‘the psychic profile of pain patients’. The 18-factor EMS structure was not approved at that time. Based on the aforementioned, EMSs were collected among first-visit pain clinic patients and a control group to measure their EMS ‘activity’. The EMS data was planned to be used to identify ‘psychic profiles’ among the groups and to understand the development of the chronic pain syndrome and the transactional processes during the treatment process. Measurement of depressiveness, EMS data and the pain variables offered a way to study different biopsychosocial models of pain with path-analysis method among the participants.

## 2. REVIEW OF THE LITERATURE

### 2.1 Chronic pain

#### 2.1.1 Definition of chronic pain

The definition of pain is well endorsed by the International Association for the Study of Pain (IASP): 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). There are different definitions of chronic pain. Some are connected to the temporal nature of pain, some to the non-healing process of pain. *‘It is not the duration of pain that distinguishes acute from chronic pain but, more importantly, the inability of the body to restore its physiological functions to normal homeostatic levels.’* (Loeser and Melzack 1999, p.1609). However, the specification of the latter is difficult. The definition of the IASP (1986) is that chronic pain is pain lasting three months or longer. Chronic pain is a personal perception, like sadness or happiness. We cannot state that someone has or has not such feelings. There are no such procedures to assess chronic pain like semi-structured standardized interview techniques in diagnosing mental disorders (e.g. Structured Clinical Interview for DSM-IV, First et al. 1997) although pain is e.g. grouped into nociceptive, neuropathic or idiopathic. The brain contains widely distributed neural networks that create an image of one’s self through genetic programmes and memories of past experience (Loeser and Melzack 1999), which have points of contact with the schema definition by Head (please see Section 2.2.1.1, Head 1920). In this text pain sensation is used to refer to a reductionistic biomedical sensory feeling, while pain perception refers to a more holistic and multimodal experience of pain.

#### 2.1.2 Pain disability

Functional ability has been identified as a crucial component of the assessment of any chronic pain condition. Return of function is also one of the most important outcome measures among chronic pain patients, and indeed the primary focus of treatment (Flor and Turk 2011). Pain disability is



related to restrictions and limitations in daily living and attributed to pain. Some patients with chronic pain become disabled. Grzesiak (1994) distinguished chronic pain syndrome patients from individuals with chronic pain as those who do not cope well and succumb to a broad array of dysfunctions. The clinical evaluation of pain-related disability during physical examination often includes functional measures such as trunk flexion, range of motion and exercise endurance. In clinical studies, however, the use of questionnaires is popular. Pain-related disability is a complex phenomenon. It has been shown that there may be a disconnection between the perceived disability and the objectively measured functional deficit in chronic LBP (Carleton et al. 2010).

Many different questionnaires have been developed to rate self-measured disability, e.g. the Oswestry Low Back Pain Disability Questionnaire, which, however, focuses more on pain intensity succeeding activity (Fairbank et al. 1980), the Roland-Morris Disability Scale to measure disability among LBP (Roland and Morris 1983) and the Pain Disability Index (PDI, Tait et al. 1987) to measure common pain-related disability. PDI is a reliable measure of pain disability (Grönblad et al. 1994, Tait and Chibnall 2005). PDI was developed and tested in St. Louis, USA, which is culturally and geographically rather different from northern Finland. In our unpublished pilot study (A.S. and T.S.), the expressions in items #1 (e.g. driving the children to school), #3 (e.g. parties, theater, concerts, dining out), #4 (e.g. housewife or volunteer worker) and #7 (Life-Support Activity) used in PDI were, however, feel to be peculiar in this cultural setting.

### 2.1.3 Epidemiology of chronic pain

Chronic pain is a worldwide problem and the number of sufferers is estimated to be as high as one third of the adult population in some countries. Chronic musculoskeletal pain is frequent all over the world, varying from 4.2% to 13.3% (Mourão et al. 2010). Among a British cohort 45 years of age, 12% of the participants reported chronic widespread pain (Vandenkerkhof et al. 2011). In a survey of North Carolina households, chronic low back pain with impairment increased from 3.9% in 1992 to 10.2% in 2006 (Freburger et al. 2009). The lifetime prevalence of spinal pain has been reported as 54% to 85.5% (Schmidt et al. 2007, Manchikanti et al. 2009). The prevalence of chronic moderate to severe pain in European residents varies from 12% in Spain to 30% in Norway being 19% in Finland (Breivik et al. 2006).

#### 2.1.4 Transition from acute to chronic pain

There are many theories on how acute pain may transform into chronic pain. Dubner and Ruda (1992) showed that huge nociceptive input can permanently change spinal cord function and thus lead to chronic pain after an acute injury. Cherkin et al. (1996) studied the 1-year outcome of back pain in primary care patients and found that 29% were not satisfied with their condition. A poor outcome was predicted by pain below the knee and depression. In the study by Thomas et al. (1999) increasing age, female sex, an earlier history of low back pain (LBP), job dissatisfaction, high level of stress, smoking and pain characteristics like radiating pain were predictors of chronicity at 12 months in primary care LBP patients. Pincus et al. (2002) argued that psychological factors, such as distress, depressive mood, somatization, are implicated in the transition to chronic LBP. Young Casey et al. (2008) studied acute pain patients at baseline and three months later and found that baseline depression and disability were the strongest predictors for pain and disability at three months. High earlier cumulative trauma exposure was an additive factor for pain chronicity. Grotle et al. (2007) showed that both psychosocial factors and emotional distress were associated with non-recovery at 12 months for first-time acute LBP. Seventeen percent of patients did not recover and among them behavioural and psychosocial distress factors like pain coping, fear-avoidance beliefs, distress, depression, workload and job-dissatisfaction predicted poor outcome. However, clinical status did not predict 12-month outcome. The authors conjectured that one possible reason for this was the small number of patients with neurological symptoms.

#### 2.1.5 Cerebral pain perceiving areas

Anatomically, the pain circuits are divided into medial and lateral nociceptive systems in the central nervous system (CNS). It has been suggested (Kulkarni et al. 2005) that the lateral nociceptive system (the ventral posterior lateral, medial and inferior nuclei of the thalamus, primary (SI) and secondary (SII) somatosensory cortices) is sensory-discriminative – stimulus localization, intensity and quality discrimination (“where does it hurt?”). The medial nociceptive system (the posterior part of the ventromedial nucleus, the ventrocaudal part of the medial dorsal nucleus, the parafascicular nucleus and the centrolateral nucleus of the thalamus, the anterior cingulate cortex (ACC), prefrontal (PFC) and insular cortex) has been proposed to be affective-motivational – related to cognitive, emotional and response selection in pain (“I don’t like it!”).

The anterior insula has been proposed to be an interoceptive brain centre, i.e. a region that constantly monitors the state of the body for changes in temperature and pain (Craig 2002, Wiech et al. 2008). People who monitor their heart rhythm well have been shown to have an increased density of grey matter within this region. The anterior insular (and the mid-cingulate) cortex also generates an anticipatory signal of expected stimulus intensity (Ploghaus et al. 1999) which affects the subsequent perception (Wiech and Tracey 2009, Apkarian et al. 2011). The posterior insula has been shown to activate for the attention of unpleasantness (Kulkarni et al. 2005) and perceiving pain (with ACC) (Apkarian et al. 2011). The grey matter density and activity of the posterior insula are associated with the magnitude of placebo analgesia (Schweinhart et al. 2009), the cognitive modulation of experimental pain (Sawamoto et al. 2000) and mu-opiate mediated neurotransmission (Zubieta et al. 2005). Based on studies with insular lesions Starr et al. (2009) concluded that the insula integrates higher-level of internal cognitive information with incoming afferent sensory information. Thus, the insula contributes to the construction of a unique signature of pain experience for each individual.

However, parietal and prefrontal cortices and caudal ACC are also linked to cognitive-evaluative pain dimension. ACC is associated with pain perception (Apkarian et al. 2011) but it also shows increased activity when a person thinks that the pain is uncontrollable (Salomons et al. 2004); thus ACC is involved in affective pain processing. Posterior ACC is linked to peri-aqueductal grey (PAG) and the descending modulation of pain and the placebo effect (e.g. Petrovic et al. 2002, Wiech et al. 2008). Interestingly, recalling previous painful episodes (without sensory input) can activate certain structures of the pain matrix corresponding to the cognitive-evaluative dimension of pain experience and this correlates to ACC activity (Kelly et al. 2007). The mid-cingulate cortex is associated with the anticipation of pain (Apkarian et al. 2011). Zhang et al. (2005) argued that ACC can both facilitate and inhibit the nociceptive, bottom-up afferent data.

Valet et al. (2004) suggested that the prefrontal cortex (PFC) exerts an inhibitory control of sensory inputs to allow cognitive networks to perform attention demanding tasks. PFC and more specifically the ventrolateral PFC (VLPFC) activation is associated with cognitive reappraisal in pain evaluating. The dorsolateral PFC (DLPFC) - posterior ACC - PAG axis and insula are associated with descending pain modulatory system and placebo effect (e.g. Wager et al. 2004, Wiech et al. 2008) and PAG with pain relief (e.g. Apkarian et al. 2011). PFC activation reflects a form of top-down control that modulates the experience of pain (Wager et al. 2004). Neuro-imaging studies that have focused on expectancy-mediated (placebo) analgesia have revealed that dorsolateral, orbitofrontal and medial prefrontal cortices may be involved in triggering this form of analgesia, which is partly mediated by descending efferent inhibitory fibres and partly e.g. by

cognitive factors (Wager et al. 2004, Rainville and Duncan 2006, Goffaux et al. 2007). It is as if the PFC '*fights*' between sensory and cognitive functions.

It may be proposed that the anatomical medial and lateral systems are neural pathways of afferent multimodal pain signals and our cognitive appraisals, emotional states and early experiences continuously modulate the multimodal pain signals and thus our pain perception. Based on the placebo studies and multimodality of pain, Wager et al. (2004, p. 1166) concluded that '*pain is a psychologically constructed experience that includes cognitive evaluation of the potential harm and affect as well as sensory components*'.

### 2.1.6 Dysfunctions in central nervous system in chronic pain

It is believed that the CNS is sensitized in chronic pain states (e.g. Brooks and Tracey 2005, Woolf 2011) and this happens both at the spinal and supraspinal levels. For these reasons even neurons not normally associated with pain will evoke painful sensations. Brooks and Tracey (2005) suggested that brain can both modulate, but also create pain perception. The relationship between reported pain intensity and the peripheral stimulus that evokes it is not, however, straightforward; it depends on factors like anxiety, arousal, depression, attention, expectation and anticipation (e.g. Wiech et al. 2008). Giesecke et al. (2004) showed that fibromyalgia (FM) and chronic LBP patients had increased cortical pain-related neuronal activation when compared with a control sample with an equivalent stimulus. Also, FM patients showed activity in emotional specific areas of CNS. Valet et al. (2004) showed that increased activity within the prefrontal and cingulate cortices during distraction decreases pain perception via the descending modulation system. On the other hand, Apkarian et al. (2004) showed a decrease in prefrontal and thalamic grey matter in chronic LBP patients and Schmidt-Wilcke et al. (2010) in ACC, insula and prefrontal cortex in persistent idiopathic facial pain. They speculated that this probably has something to do with the decreased modulation of pain (top-down modulation). The thalamic atrophy (Apkarian et al. 2004) may be related to the generalized sensory abnormalities often seen in chronic pain patients.

### 2.1.7 Effects of affective and behavioural factors on pain perception in CNS

The gate-control theory of pain included the view that there is a descending modulatory system which can block nociceptive afferent information (Melzack and Wall 1965). Thus the brain centres

responsible for psychological processes could potentially increase pain perception by opening the gating mechanisms in the dorsal horn of the spinal cord or decrease pain perception by closing those gating mechanisms. Later on, these modulatory effects are specially linked to serotonergic (e.g. De Ponti and Tonini 2001) and noradrenergic (e.g. Fields and Basbaum 1999) descending antinociceptive systems. In depressive states, these descending modulatory pathways are supposed to go down allowing more intrinsic sensory data to enter awareness. This was shown among depressed FM patients whose descending inhibitory system showed deficiency (de Souza et al. 2009). A recent study showed that emotional state can influence pain perception, namely negative emotional states enhanced pain evoked activity in limbic regions, such as the ACC and insular cortex (IC) (Phillips et al. 2003). Singer et al. (2004) showed that empathy for pain involves the affective but not sensory components of the aforementioned areas of pain perception. If we are “empathetic for pain” and see our loved ones to seemingly perceive pain, our anterior IC and ACC are activated reflecting the affective component of pain. Thus, we can feel pain without a peripheral nociceptive input. Chronic pain is regarded as a more emotional, cognitive and memory related phenomenon involving the medial nociceptive system than in acute pain. Apkarian et al. (2005) stated that chronic pain conditions may be a reflection of decreased sensory processing and enhanced emotional and cognitive processing. Physiological and behavioural studies have shown that plasticity, or learning, has a role in pain (e.g. Pleger et al. 2005). It seems very clear that the CNS is heavily involved in chronic pain. Thus the terms nociceptive, neuropathic and idiopathic reflect a dualistic model of pain and are even forgotten in chronic pain - all chronic pain is, in a way, in the CNS (Toda 2011, Wand et al. 2011).

### 2.1.8 The Biopsychosocial model of pain

The traditional biomedical view of pain can be summarized as follows (Duncan 2000).

- Pain is a simple bodily sensation, the function of which is to avert the organism from harm.
- In medical diagnosis, pain is a vital symptom, signifying underlying pathology.
- The ethics of medical practice demands that pain be avoided or alleviated as much as possible.

However, the traditional biomedical model of pain has many important limitations, namely 1) the level of pain is rarely directly proportional to the underlying tissue damage, 2) treatments designed to correct underlying tissue damage often fail to abolish persistent pain and 3) the traditional model ignores the profound influence of psychological and social factors on the pain experience. Pain is a

dynamic process that is influenced not only by biological, psychological and social mechanisms but also produces biological, psychological and social changes which, in turn, affect future responses to pain (Keefe and France 1999). The intensity of chronic pain frequently bears little or no relation to the extent of tissue injury or other quantifiable pathology (Loeser and Melzack 1999). The biopsychosocial model of pain guides us away from the Cartesian concept of pain as a sensation produced by injury, inflammation or other tissue pathology toward the concept of pain as a multidimensional experience (Melzack 1999).

Half a century ago Engel (1959) introduced his view of the “pain-prone patient” and hypothesized that various constellations of negative childhood physical or emotional experiences, such as abuse, punishment and neglect establish a proclivity towards the development of pain in excess of what would be expected for the known peripheral stimulus [e.g. lesion]. The biopsychosocial model of illness (Engel 1977) highlights the importance of biological, psychological and environmental contributions to the aetiology and therapy of all diseases. The biopsychosocial model of pain arose during the 1980s, partly in the response to the gate-control theory of pain (Melzack and Wall 1965) and the biopsychosocial model of illness (Engel 1977), but also to the inability of (bio)medicine to treat chronic, intractable pain and control pain related disability. Grzesiak (1994) attempted to unite Engel’s (1959) theory of the pain-prone patient to the neuromatrix theory of Melzack (1991) and gave equal valence to the psychological and body selves in the formation, relief and prevention of the chronic pain syndrome. Rome and Rome (2000) investigated chronic pain, kindling phenomenon and neuroplastic changes in the brain and proposed a model in which lifetime experiences and somatosensory inputs may produce the neural network to form persistent pain and affective and behavioural changes. Although there is a wealth of evidence pointing to the biological factors associated with chronic pain, there is a growing body of evidence of social and psychological factors affecting the course and outcome of pain (e.g. Burton et al. 1995, Gatchel et al. 1995, Linton 1997, Monti et al. 1998).

Patients who reject the psychological and behavioural approaches to pain treatment out of the belief that such approaches imply that their pain is not taken seriously, are also operating with the body-mind dualism characteristic of biomedical culture (Crowley-Matoka et al. 2009). The health care system policy, which gives more compensation for nerve blocks etc. but not for the additional clinical visit time that might be required to address the complex psycho-social aspects of a patient's pain syndrome, is acting in the same biomedicalistic way (Crowley-Matoka et al. 2009).

#### *2.1.8.1 Biomedical factors in pain and disability*

From the biomedical factors, several predictors of pain and disability have been found: female sex (Neubauer et al. 2006), male sex (Koleck et al. 2006), age (Natvig et al. 2002, Lindell et al. 2010), pain factors (Linton and Boersma 2003, Westman et al. 2008), self-reported pain intensity (Hansson et al. 2006, Shaw et al. 2007), bodily pain (Gun et al. 2005), many pain sites and widespread pain (Natvig et al. 2002, Neubauer et al. 2006), increased LPB episode duration (Kovacs et al. 2005, Dunn and Croft 2006, Neubauer et al. 2006) and earlier LBP (Brage et al. 2007). Increased body mass index and the decreased muscular strength predicted a poorer outcome in painful knee osteoarthritis (Sharma et al. 2003).

#### *2.1.8.2 Affective factors in pain and disability*

From among the affective factors, emotional distress (Brage et al. 2007, Grotle et al. 2007), depression (Dionne 2005, Mercado et al. 2005), somatization (Dionne 2005) and poor mental health (Sharma et al. 2003) have been shown to predict a poorer outcome of disability. Epping-Jordan et al. (1998) evaluated the effects of pain intensity, depressiveness and disability on each other (as factors) in men with LBP over a time span of 12 months. It appeared that pain intensity predicted pain intensity, disability predicted disability and depressiveness accordingly predicted depressiveness. However, pain intensity had no effect on disability or depressiveness. Disability at two months predicted depressiveness at 12 months. Disability at six months predicted pain intensity and depressiveness at 12 months and depressiveness accordingly predicted disability. The statistical method used was hierarchical regression analysis, which may not be so sensitive in defining the direction of effects. Depression was also found to be associated with the transition from acute to chronic LBP (Neubauer et al. 2006). One can imagine how abusive early experiences or long treatments in hospital as a child have produced an emotional environment where the present pain can be felt to be overwhelming, oneself powerless and how in this situation the pain can be felt to be uncontrollable. This may take place in ACC and facilitate the pain projection to pain perceiving areas.

#### *2.1.8.3 Cognitive factors in pain and disability*

Truchon (2001) argued that cognitive variables are among the best predictors of LBP related chronic disability and Salomons et al. (2004) that they have a powerful influence on pain response.

From the cognitive factors, low self-prediction of return to work (Lindell et al. 2010) and low patient's perceived chance of being able to work (Linton and Boersma 2003) were shown to be predictors of disability. Also, the fear of movement/(re)injury beliefs (Swinkels-Meewisse et al. 2006, Söderlund and Asenlöf 2010), fear avoidance beliefs (Grotle et al. 2004, Samwel et al. 2007), low self-efficacy beliefs (Sharma et al. 2003, Dobkin et al. 2010, Söderlund and Asenlöf 2010) and helplessness (Samwel et al. 2007) were shown to be predictors of disability. In a prospective design, Neubauer et al. (2006) were able to show that the catastrophizing and beliefs of helplessness were cognitive factors that predicted back pain six months later.

*Pain catastrophizing* has been characterized as a tendency to focus excessively on the pain sensation (rumination), to exaggerate its threat (magnification) and to perceive oneself as being helpless to control the pain symptoms (Sullivan et al. 2001). Thus catastrophizing can be seen as a tendency towards excessively negative thoughts and emotions in relation to pain. Recent brain-imaging studies on healthy volunteers, LBP and FM patients have shown that pain catastrophizing is associated with increased activity in the ACC and insula areas (suggesting an increased facilitation of afferent stimuli, Gracely et al. 2004) and decreased activity in the DLPFC area (suggesting a decreased top-down modulation of pain, Seminowicz and Davis 2006, Lloyd et al. 2008). Catastrophizing both increased the anticipation of and attention to pain irrespective of depression and decreased the activity in the areas modulating the pain sensation. It is plausible that the cortical response to pain is influenced by an individual's level of catastrophizing (Seminowicz and Davis 2006).

Pain catastrophizing is associated with maladaptive pain behaviour (illness-related behaviour which is disproportionate to the underlying physical disease), which in turn is associated with the decreased top-down regulation of pain (Lloyd et al. 2008). Thus, maladaptive, exaggerated pain behaviour may be associated with poorer ability to control pain by decreased efferent pain modulation. Pain catastrophizing has been shown to predict increased pain sensation (Vase et al. 2011), pain intensity (Sullivan et al. 2005), pain disability (Severeijns et al. 2001, Sullivan et al. 2005), a poorer quality of life (Lamé et al. 2005) and suffering (Wade et al. 2011). It may also reduce the ability of a pain patient to undertake rehabilitative movements e.g. after LBP. From the early maladaptive schema (EMS) perspective, pain catastrophizing beliefs show similarity with Vulnerability to Harm or Illness (VH) and Negativity/Pessimism (NP) EMSs (Table 1). Pain catastrophizing, *helplessness* (e.g. Seligman 1990), the fear of pain and fear-avoidance (Lethem et al. 1983) models are much related and share common phenomena. The *fear-avoidance* model has been attributed a central role in explaining the development of functional disability due to chronic pain (Vlaeyen and Linton 2000). The model is based on anxiety cognitions that highlight and raise a



patient's concerns about the painful consequences of activities, and accordingly enhance avoidance behaviour which in turn leads to deconditioning and to the development of disability and helplessness (Moore 2010). Particularly, the *fear of pain* is associated with the perception that activity will lead to an increase in pain (Vlaeyen and Linton 2000). A transactional process of helplessness-hopelessness was predictive of a negative outcome (i.e. low emotional adjustment) among LBP patients (Koleck et al. 2006). In a study by Samwel et al. (2006), helplessness was also shown to be a predictor of pain intensity and disability among chronic pain patients.

Alford et al. (1995) named *hopelessness* as '*the negative view of future*' (Cognitive triad; Beck et al. 1979) and showed that it predicted future depressive symptoms. In the study by Samwel et al. (2007) helplessness was shown to predict functional disability among chronic pain patients. Koleck et al. (2006) claimed that *helplessness-hopelessness* had a rather negative influence on the outcome among LBP patients. Pain level was best predicted by helplessness attributional style and disability was best predicted by helplessness attributional style and passive behavioural pain-coping strategies (Samwel et al. 2006). Helplessness and worrying were also predictors of depression. Helplessness has points of contact with Failure (FA), VH and Dependence/ Incompetence (DI) EMSs and hopelessness with NP EMS (Table 1).

*Self-efficacy* is defined as the expectation that one can execute a behaviour required to produce a desired outcome (Bandura 1977). Pain self-efficacy beliefs are one of the most studied cognitive structures in chronic pain (e.g. Estlander et al. 1994, Arnstein et al. 1999). Lack of self-efficacy is associated with pain and disability (Estlander et al. 1994, Meredith et al. 2006). Those high in self-efficacy beliefs have been reported to have higher pain thresholds and tolerance to experimentally induced thermal pain (Keefe et al. 1997). High self-efficacy beliefs are associated with chronic pain patients' level of functioning and response to treatment. Lower self-efficacy beliefs are associated with higher levels of depressiveness and hopelessness (Anderson et al. 1995). The patterns of DI, FA and even Enmeshment/ Undeveloped Self (EM) EMSs and the behaviour driven by them have similarities with low self-efficacy beliefs (Table 1).

Conceptualized as a type of perceived control, the *health locus of control* (health LOC) refers to an individual's belief or expectancy regarding who or what determines health outcomes. The belief that health outcomes are determined by one's own behaviour reflects an *internal* orientation. The belief that outcomes are determined by others' actions or by chance/fate/luck reflects an *external* orientation (e.g. Wallston et al. 1978, Stevens et al. 2011). Härkäpää (1991) showed that subjects with more external LOC beliefs reported more severe pain intensity and the internal LOC beliefs were associated to more adaptive behavioural coping strategies. External LOC has been shown to predict poorer outcome among LBP patients (e.g. distraction-praying, external LOC; Koleck et al.

2006). Zenker et al. (2006) were able to show that external LOC was associated with a higher intensity of pain, increased opioid consumption, a view of the pain as a purely medical problem and themselves as dependent on health care utilization. Multidimensional pain treatment has been shown to increase the internal LOC among pain patients (Coughlin et al. 2000). External LOC seems to be associated with DI, Subjugation (SB) and FA EMSs (Table 1).

#### *2.1.8.4 Social factors in pain and disability*

From the social factors, a low grade of education (Brage et al. 2007), poor social support (Sharma et al. 2003), high prior sick listing (Natvig et al. 2002, Linton and Boersma 2003, Lindell et al. 2010) and injury compensation (MacDermid et al. 2002) were shown to be predictors of disability. Eisenberger and Lieberman (2004) showed that the emotional pain of social exclusion will overlap the neural circuitry and computational processes of physical pain. Couples who exhibited high levels of hostility showed two days longer wound healing than couples with low hostility (Kiecolt-Glaser et al. 2005). The wounds healed twice as fast in hamsters which were not isolated when compared with isolated animals (Detillion et al. 2004). Finestone et al. (2008) therefore suggested that social factors may well have an effect on pain chronicity. However, in the study by Flor et al. (2002), the existence of a spouse who habitually reinforced pain behaviours caused a 2.5-fold increase in the patient's brain response to pain applied to the back when compared with a spouse who ignored the pain. According to my own experiences, chronic pain patients are often frustrated and angry, which can easily cast the pain patient and pain treating personnel in hostile transactional roles, which further diminishes the possibilities to be treated well.

#### *2.1.8.5 Behavioural factors in pain and disability*

Of the behavioural factors, sleep disturbances (Natvig et al. 2002, Linton and Boersma 2003, Salo et al. 2010), a general tendency not to adhere to the skills learned and the recommendations made during the multimodal treatment programme (Dobkin et al. 2010), avoidance (Samwel et al. 2007), functional limitation (Shaw et al. 2007), high physical job stress (Brage et al. 2007), passive coping strategies (Mercado et al. 2005), guarding (Truchon and Côté 2005), smoking (Natvig et al. 2002) and heavy lifting at work (Natvig et al. 2002) have been shown to predict disability. The passive coping strategies of resting and retreating are considered a maladaptive response to pain. Avoidance behaviour includes avoidance of movement, activity, social interaction and leisure pursuits.

Physical and social activities are avoided because they are expected to cause an increase in pain and suffering. Avoidance behaviour may prevent patients from correcting their negative expectations of the consequences of activities and may strengthen the passive cognitive coping strategy of worrying and catastrophizing (Samwel et al. 2006). Avoidance behaviour alone has been shown to predict pain disability and distress in chronic pain populations (van Lankveld et al. 2000, Samwel et al. 2006). In a prospective study by Samwel et al. (2007), avoidance behaviour was the strongest predictor of functional disability among 181 chronic pain patients. Worrying, helplessness beliefs, catastrophizing, depressiveness and fear of pain are all associated with avoidance behaviour (Samwel et al. 2006, 2009). FM patients high in instructed physical activity showed a decrease in artificially induced pain sensation which was explained by increased DLPFC activity, and thus probably by the descending modulation of pain (McLoughlin et al. 2011).

#### *2.1.8.6 Chronic pain and early maltreatment and adversities*

Medically explained and unexplained physical symptoms are associated with childhood maltreatment (Arnow 2004). Childhood physical, sexual and emotional abuse have been shown in numerous studies to be associated with chronic pain in adulthood (e.g. Lampe et al. 2000, Imbierowicz and Egle 2003, Sansone et al. 2006, Thomas et al. 2006, Hu et al. 2007) and also with depressiveness (e.g. Schilling et al. 2007, Aguilera et al. 2009, Karevold et al. 2009, Rubino et al. 2009). The reporting of abusive or neglectful childhood experiences is associated with an increased risk of experiencing chronic pain in adulthood (Davis et al. 2005). Physical and sexual abuse in childhood is connected with non-specific chronic pain and pelvic pain (Latthe et al. 2006, Paras et al. 2009). However, sexual and physical abuse are easier to recognize than more covert emotional abuse. *'Emotional abuse and neglect will continue to pose a challenge to professionals concerned with ensuring the well-being of children'* (Glaser 2002, p. 711). The association of chronic pain and emotional maltreatment alone has been less studied. However, emotional abuse and neglect have been shown to be associated with FM (Walker et al. 1997, Van Houdenhove et al. 2001a). Depression is often claimed to be a mediator between childhood trauma and pain, but sexual abuse *per se* is also associated with adult chronic pain (Brown et al. 2005). The same has been found between physical abuse and pain (Walsh et al. 2007).

## 2.1.9 Chronic pain and depression

The prevalence of pain among depressive patients ranges between 5% and 100% and the prevalence of major depression with chronic pain varies 1.5% - 100% according to the context (i.e. population survey, primary care, pain clinic; Gambassi 2009). The causality and temporal association of pain and depression have been a focus of numerous studies. Magni et al. (1994) suggested that depression promotes pain and pain promotes depression. Fishbain et al. (1997) tentatively suggested that chronic pain precedes depression hence depression is the consequence of chronic pain. However, Currie and Wang (2005) in their longitudinal study concluded that major depression increases the risk for a pain-free individual to develop a future chronic pain almost threefold, hence depression is an antecedent risk factor for chronic pain.

According to Pincus and Williams (1999), the most damaging of all models between depression and pain arises from the dualistic thinking that describes pain in the absence of identified organic cause as a presentation of 'repressed' depression. They argued that depression in chronic pain might be a variation of depression. Maybe the feelings of guilt and shame are not the salient ones. Finally, they suggested that instead of searching a causal path between pain and depression, we should accept that this simple solution does not describe the experience of most pain patients. Affect and sensory information are processed in parallel and even if one of these is more dominant, the relationship is most likely cyclical.

In a recent Finnish doctoral dissertation (Kuusinen 2004), a pain-prone personality trait did not gain statistical support among painful rehabilitation institution participants. The pain intensity and somatic-performance (BDISOM) and cognitive-affective (BDIPSY) factors of the Beck Depression Inventory (BDI) formed an independent model. Instead, the author confirmed a model where pain intensity has an effect on depressiveness (BDI) via pain disability and control beliefs. In a longitudinal design, pain intensity and depressiveness did not predict each other. However, Neubauer et al. (2006) showed that depression was found to be associated with the transition from acute to chronic LBP. The reliability of depression diagnoses among chronic pain patients has been questioned. However, standardized semi-structural interviews have shown the prevalence of major depression to be as high as 73% among chronic LBP patients (Gallagher et al. 1995).

### 2.1.10 Chronic pain and personality disorders

Reich et al. (1983) used a 2-hour semi-structured interview based on flow-sheets derived from the Diagnostic and Statistical Manual of Mental Disorders – 3<sup>rd</sup> edition (DSM-III, American Psychiatric Association 1980) to diagnose personality disorders (PD) in 43 individuals suffering from chronic pain. Of the 43 subjects 20 (47%) met the criteria for PDs. The most frequent diagnoses were histrionic (n = 6) and dependent (n = 5) PDs. One of the most interesting findings was the wide range of PDs identified in this sample of patients with chronic pain, with a total of seven of the 12 possible disorders represented. Fishbain et al. (1986) conducted an extensive study on 283 patients with chronic pain. The interviews were consistent with the DSM-III guidelines. The authors found a higher prevalence (59% vs 47%) of at least one PD diagnosis than was found in the study by Reich et al. (1983). The most frequent diagnoses found were dependent (17%), passive-aggressive (15%), histrionic (12%), and compulsive PD (7%). Polatin et al. (1993) conducted a study of PDs among 200 chronic LBP patients. Subjects were interviewed at the time of entry into a comprehensive pain and rehabilitation programme. The criteria for at least one PD were met by 51% of subjects, whereas 30% met the criteria for more than one PD. The most common PD diagnoses were paranoid (33%), borderline (15%), avoidant (14%), and passive-aggressive (12%). Polatin et al. (1993) also found a high prevalence of lifetime diagnostic criteria of at least one psychiatric diagnosis (e.g. depression, schizophrenia, social phobia, 77%) and a current major depressive disorder (45%), which may have affected their Axis II findings (e.g. personal disorders).

In another study, Gatchel et al. (1996) evaluated 51 acute and 50 chronic patients with temporomandibular joint disorder (TMD). The results revealed a higher prevalence of PDs among the chronic than the acute patients although this difference was statistically insignificant. The most common PDs in the chronic TMD patients were paranoid PD (18%), followed by both obsessive-compulsive PD (10%) and borderline PD (10%). As many of the chronic pain patients suffered from depression and anxiety, Monti et al. (1998) excluded from their study the pain patients with Axis I disorders. The prevalence of PDs was about 60% among the complex regional pain syndrome (CRPS) and 64% among the disc-related radiculopathy pain patients groups. Thus the use of the Young Schema Questionnaire (YSQ) to test EMSs among chronic pain patients seems warranted.

### 2.1.11 Present and future lines of the biopsychosocial model and chronic pain

The advanced research of neurobiology of chronic pain has combined psychological and biomedical factors at the CNS level. Knowledge of the 'pain matrix' and its function in chronic pain is growing but is still insufficient. Brain imaging studies have taught us about the interactivity of different brain sites in different situations and how neuroplasticity works in learning processes. The learning processes are complicated phenomena where personal, social, environmental and genetic factors are in constant interactive influence. Chronic pain can also be considered a consequence of a learning process where biological, psychological and social experiences are processed in an unfavourable manner.

The biopsychosocial model serves one theoretical base for the integrated treatment models of chronic pain. It includes biomedical antecedents, affective and cognitive modulators, which can be situated in the 'pain matrix' of brain and behavioural consequences, all affecting the pain disease (Figure 1). However, not even vigorous treatment attempts based on the biopsychosocial model of chronic pain have so far been sufficient. Maybe contemporary brain study will in future 'fill in the gaps' and serve us an even more comprehensive model of chronic pain. Toda (2011) has suggested that the term 'psychogenic' pain should be abolished in favour of the term 'braingenic' pain. Wand et al. (2011, p.18) argue *'as such, it seems reasonable to suggest that the brain may be the legitimate target for new therapies [in low back pain]'*. In my opinion the CNS and in particular the brain are the main scenes for chronic pain. Based on the aforementioned and the chronic pain related early traumatization, hopelessness-helplessness and catastrophizing beliefs, the co-existence of depression and PDs, one can ask: *'Have chronic pain patients lived in an abusive or maltreating environment; have they felt (emotional) pain early in life; do they have emotional memories which would exacerbate their pain perception; do they have cognitive structures which can cast them into maladaptive ways of thinking that size up pain perception or reduced abilities to modulate their pain? Should we assess their early maladaptive schemas?'*. Schema-focused therapy (SFT) has not been tested in chronic pain patients but theoretically it would be worth a try.

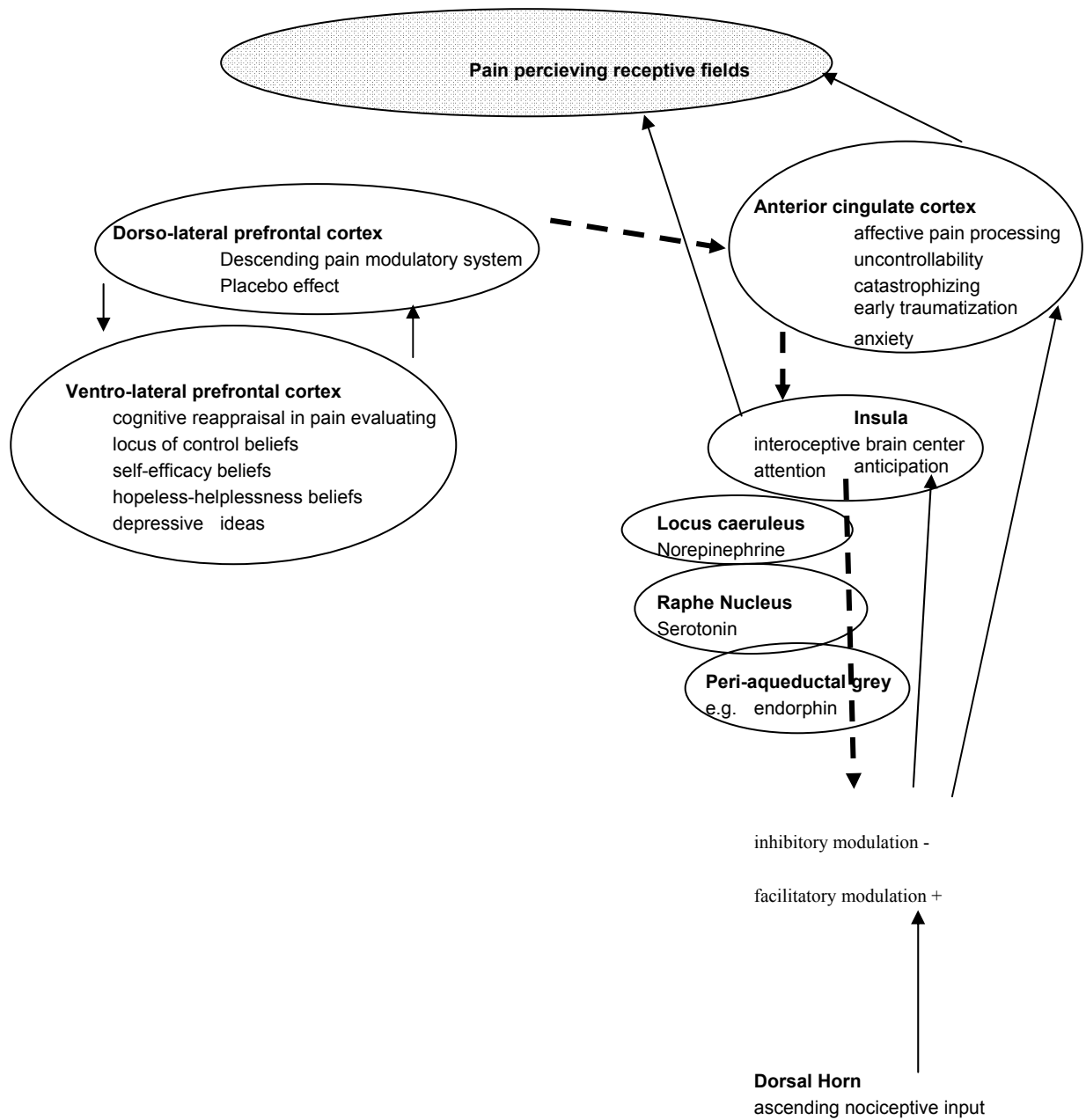


Figure 1: A hypothesized model of emotional and cognitive pain modulation: ascending (→) and descending (- - ->) systems in different areas of the brain.

## 2.2 Early maladaptive schema

### 2.2.1. The schema concept in different contexts

The word 'schema' (pl. schemata or schemas) comes from the Greek word "σχῆμα" (skhēma), which means 1) (*technical*) a representation of a plan or theory in the form of an outline or model, 2) (*Logic*) a syllogistic figure and 3) (in Kantian philosophy) a conception of what is common to all members of a class; a general or essential type (Soanes and Stevenson 2008). The schema concept in different contexts with reference to early maladaptive schema (EMS) concept is introduced as follows.

#### 2.2.1.1 Schema as a representation of the body and posture

Sir Henry Head (1861 - 1940) was an English neurologist who conducted pioneering work on the somatosensory system and sensory nerves. He studied e.g. posture, movement and the body in space and used the word '*schema*' as follows: '*The sensory cortex is the storehouse of past impressions. They may rise into consciousness as images, but more often, as in the case of special impressions, remain outside central consciousness. Here they form organised models of ourselves which may be called schemata. Such schemata modify the impressions produced by incoming sensory impulses in such a way that the final sensations of position or of locality rise into consciousness charged with a relation to something that has gone before*'. Thus, Sir Henry Head used the '*schema*' word in a plastic, transforming manner about organised, mainly postural models of ourselves which are always charged with something from the past and which also constantly change (Head 1920). Interestingly, Weeks et al. (2010) refer to Head and Holmes (1912), and to the concept of a "body schema" when theorizing the causes for phantom limb pain. The body schema seems to be covered. It has been shown that when the representation of the body in the somatosensory cortex is altered, it is often related to increased chronic pain intensity.

#### 2.2.1.2 Schema in remembering, assimilating and accommodating to new data

In sir Frederic Bartlett's (1886 – 1969) book "Remembering: A study in experimental and social psychology" (1932/1954), he preferred the word '*setting*' [later on in his book; organised setting] to



the word 'schema'. He also stated that the influence of temperament, interests and attitude in perceiving and remembering is of the utmost importance. The importance of a prior experience in determining how and what we perceive became a very salient issue for him. Thus the preformed schemas were aids for immediate identification, e.g. for labelling visual patterns, and he regarded schemas as active although not conscious.

In remembering, we appear to be dominated by particular past events which are more or less dated, or placed, in relation to other associated particular events. All of us, in reference to some of our 'schemata', have probably completed the model and now merely maintain it by repetition. In Head's (1920) terminology this is the most natural way of retaining a completed 'schema' undisturbed as far as possible. In more conventional psychological language, perhaps, it is an organism's or an individual's way of sustaining an attitude towards the environment which it finds or feels to be adequate and satisfactory. In remembering a man constructs on the basis of 'schema'. Bartlett suggested that in remembering, we are dominated by past events, and argued that we maintain our models by repetition (Bartlett 1932/1954).

The Swiss psychologist Jean Piaget (1896 – 1980) used the word '*adaptation*' for adaptive, spiral processes assimilating new data to antecedent structures which he called '*schemata*'. '*Intelligence is an adaptation*' (Piaget 1936/1953). '*Assimilation*' was the term used when new data could be proofed to earlier structures. He argued that mental life is also accommodation to the environment. In '*accommodation*', the internal world (person's mind) has to accommodate itself to the evidence with which it is confronted and thus adapt to it. The process of accommodation involves altering one's existing schemas as a result of new information or new experiences. Assimilation can never be pure, because, by incorporating new elements into its earlier schemata, the intelligence constantly modifies the latter in order to adjust them to new elements. Every intellectual operation is always related to all the others and its own elements are controlled by the same law. Every schema is thus coordinated with all the other schemata and itself constitutes a totality with differentiated parts. According to Piaget, (one would propose that) the earlier the adaptation occurs, the more universal and global an individual schema may become. In Bartlett's and Piaget's view, schemas help us to remember, identify and assimilate something new. However, they guide us from a '*past perspective*'.

### 2.2.1.3 Schema in constructing one's self

Markus (1977) was interested to first categorize and then study psychology students according to dependent-independent self-schema. She thought that individuals are selective in what they notice, learn and remember. She argued that self-schemata are cognitive generalizations about oneself, derived from past experience, which organize and guide the processing of self-related information contained in the individual's social experiences. Self-schemata influence both input and output of information related to oneself. She also argued that, once established, these schemata function as selective mechanisms which determine whether information is attended to, how it is structured and how much importance is attached to it. Markus also showed that self-schemata become increasingly resistant to inconsistent or contradictory information. She was [among] the first to prove this. In her study, self-schemata were not yet classified to be maladaptive or harmful.

In their book 'Social Cognition', Fiske and Taylor (1984, p. 141) claimed that '*a schema is a cognitive structure that represents organized knowledge about a given concept or type of stimulus*'. The schema concept specifically maintains that information is stored in an abstract form, not simply as a collection of all the original encounters with examples of the general case. Schemata are theories or concepts that guide how people take in, remember and make inferences about raw data. Schemata focus primarily on cognition: on how general information is represented in the memory and on how new information is assimilated with existing knowledge. They supposed that schemas caused people to simplify reality.

Self-schemata describe the way people rate themselves [and recognise traits in others], perceive, remember and draw inferences. Fiske and Taylor (1984) called people '*schematics*' if they had certain schemata and if they did not, they called them '*aschematics*'. Being schematic on a particular dimension allows a person to filter incoming information about that dimension. Fiske and Taylor believed that being schematic makes people think harder about all schema-relevant information that comes to their way. Self-schemata help people to remember the schema-relevant information. They muster evidence in support of their self-concept. They claimed that self-schemata are difficult to change. In a way, schemata preserve personal integrity. The writers stated that the self-concepts may be stored in memory in verbal form as opposed to the concepts of other people, which may be stored in visual form. In sum, self-schemata constitute a familiar, affective, robust, complex and verbal self-portrait. Although Fiske and Taylor regarded self-schemata as positive, self-enhancing, they nevertheless highlighted the possibility that depressed people are exceptions to this. They may have a negative self-schema.

#### 2.2.1.4 Schema in constructing one's self, the world and the future

Aaron Beck (1972) elaborated his schema conception from previous work by Piaget (schemata, 1948), Rapaport (conceptual tools, 1951), Postman (categories, 1951), Kelly (personal constructs, 1955), Bruner et al. (coding systems, 1956), Sarbin et al. (modules, 1960) and Harvey et al. (concepts, 1961). He defined schema as *'a structure for screening, coding and evaluating the stimuli that impinge on the organism. It is the mode by which the environment is broken down and organized into its many psychologically relevant facets. On the basis of the matrix of schemas, the individual is able to orient himself in relation to time and space and to categorize and interpret his experiences in a meaningful way'* (Beck 1972, p. 283). Beck did not speculate about the nature of the early experiences generating these schemas. The schema condenses and molds raw data into cognitions. He argued that idiosyncratic schemas can be deduced from the people's stories; the ways in which they structure experiences of different kinds; from the content of the ruminations or reveries of them. Details and external raw data are selectively extracted and molded to fit the schema.

Later in the book 'Cognitive Therapy of Depression' (Beck et al. 1979), the schema concept was defined in an association with depressiveness. From a plethora of stimuli an individual selectively attends to specific stimuli, combines them in a pattern and conceptualizes the situation. Schemas form the basis for the regularity of interpretations of a particular set of situations. The schema is the basis for molding data into cognitions. The patient categorizes and evaluates his experiences through a matrix of schemas. The writers also pointed out that a certain schema may be dormant and e.g. erupt due to stress, divorce or loss. These negative concepts (schemas) can be activated by specific circumstances analogous to the experiences initially responsible for embedding the negative attitude. The writers do not mention early adversities in the formation of these schemas. When the schemas are activated, they first emerge from well matching stimuli but later they are evoked by a wider range of stimuli which are less logically related to the schema. Idiosyncratic schemas may lead to the distortions of reality and consequently to systematic errors in the depressed person's thinking. In this way Beck and co-writers set the stage for a deleterious schema concept.

## 2.2.2 The early maladaptive schema (EMS) concept

### 2.2.2.1 Introduction of schema-focused therapy by Young

In the book, 'Cognitive therapy for personality disorders: A schema-focused approach' (1990), Jeffrey Young presented the early maladaptive schema (EMS) concept as an extension of the work by Beck (1967) and Beck et al. (1979) but also substantiated his theory with the findings of Millon (1981) and Guidano and Liotti (1983). Young also cited Segal's (1988, p. 147) opinion that schemas are '*organised elements of past reactions and experience that form a relatively cohesive and persistent body of knowledge capable of guiding subsequent perception and appraisals*'. EMSs refer to extremely stable and enduring themes that develop during childhood and are elaborated upon throughout an individual's lifetime. EMSs serve as templates for the processing of later experience.

Young (1990) regarded EMSs as unconditional beliefs about oneself in relation to the environment. They are *a priori* truths that are implicit and taken for granted and have points of contact with Guidano and Liotti (1983, p. 67): '*our own tacit self-knowledge is a constitutive part of ourselves; with no real alternatives*'. EMSs are also self-perpetuating and therefore fairly resistant to change. Young (1990) claimed that EMSs are developed early in life and often form the core of an individual's self-concept. Thus, the threat of schematic change is too disruptive to the core cognitive organization. EMSs are dysfunctional in some significant and recurrent manner. They may cause psychological distress, destructive relationships, inadequate or excessive work performance, addiction or psychosomatic disorders. They are usually activated by events in the environment relevant to the particular schema. EMSs are closely tied to high levels of affect. They are probably the result of dysfunctional experiences with parents, siblings, peers, etc. during the first few years of the individual's life. Rather than resulting from isolated traumatic events, most schemas emerge through the ongoing patterns of everyday noxious experiences which cumulatively strengthen the schema. Millon (1981, p. 101) stated that '*significant experiences of early life may never recur again, but their effects remain and leave the mark*'.

### 2.2.2.2 The contemporary EMS concept

Young (1990, 1999) developed the schema-focused therapy (SFT) to treat patients with chronic characterological problems who were not being adequately helped by traditional cognitive

behavioural therapy (CBT). SFT addresses the core psychological themes. According to the schema theory (Young 1990) early childhood experiences lay the foundation for an individual's patterns and models of the self, others and the world. Schemas develop out of interplay between a child's innate temperament and the ongoing harmful experiences of the child with the significant others (Young and Behary 1998). Every child needs nurturing, safety, love, understanding and acceptance for the innate needs to be met. If this fails and the needs of the child are neglected, if the child is abused or otherwise maltreated, he/she develops adaptive schemas for that life situation to cope and survive which later in life become maladaptive. They are called Early Maladaptive Schemas (EMS).

EMS is defined as *'a broad, pervasive theme or pattern; comprised of memories, emotions, cognitions, and bodily sensations; regarding oneself and one's relationships with others; developed during childhood or adolescence; elaborated throughout one's lifetime; dysfunctional to a significant degree'* (Young et al. 2003, p. 7). An individual's behaviour is not part of the EMS itself - maladaptive behaviour develops as a response to an EMS. There are now 18 different schemas grouped into 5 hypothesized schema domains (Table 1). Every domain represents one important part of the core needs of the child. Childhood neglect, adversities, maltreatment and abuse produce, for example, EMSs like Abandonment/ Instability (AB), Mistrust/ Abuse (MA) or Emotional Deprivation (ED) which belong to the Disconnection and Rejection schema domain according to the SFT (Young 1999, Young et al. 2003). Because of their early origin, the individual regards the EMSs as familiar, the best and most reliable way to construe and manage different life situations. The emotionally neglected child copes, for example, by emotional withdrawal. Later on in adulthood the withdrawal continues and impairs or inhibits close relationships and the EMS is repeated again and again, and is thus empowered. The focus of SFT is to recognise, alleviate and even eliminate these EMSs.

Stallard (2007) assessed 12 EMSs among children aged 9-18 and found a temporal stability in eight of them. Seven of the EMSs were unconditional. The study supported the view of the development and stabilization of EMSs at an early age and the proposal that the unconditional EMSs develop earlier than the conditional ones. In the study by Rijkeboer and Boo (2010), 8-13 year old children showed EMSs related to trait neuroticism. Self-Sacrifice (SS) and Enmeshment (EM) were the only EMSs not associated with depressive mood, hence SS and EM seemed to be adaptive in that age. In the study by Thimm (2010b), high neuroticism in particular, but also low extraversion, low agreeableness, and/or low conscientiousness were associated with most EMSs.

### 2.2.2.3 Listing of the five schema domains and the 18 EMSs

The 18 EMSs are grouped into five hypothesized Schema Domains as shown in Table 1.

**Table 1.** Five Schema Domains, 18 Early Maladaptive Schemas and an example item of each schema (Young et al. 2003).

Schema Domain	Early Maladaptive Schema	Example item	Abbreviation
Disconnection & Rejection	1. Abandonment/ Instability	<i>"I worry that people I feel close to will leave me or abandon me."</i>	AB
	2. Mistrust / Abuse	<i>"I'm usually on the lookout for people's ulterior motives."</i>	MA
	3. Emotional Deprivation	<i>"I have rarely had a strong person to give me sound advice or direction when I'm not sure what to do"</i>	ED
	4. Defectiveness/ Shame	<i>"I feel that I'm not lovable."</i>	DS
	5. Social Isolation/ Alienation	<i>"I feel alienated from other people."</i>	SI
Impaired Autonomy & Performance	6. Dependence/ Incompetence	<i>"I do not feel capable of getting by on my own in everyday life."</i>	DI
Impaired Limits	7. Vulnerability to Harm or Illness	<i>"I feel that a disaster (natural, criminal, financial, or medical) could strike at any moment."</i>	VH
	8. Enmeshment/ Undeveloped Self	<i>"It is very difficult for my parent(s) and me to keep intimate details from each other, without feeling betrayed or guilty."</i>	EM
	9. Failure	<i>"I'm not as intelligent as most people when it comes to work (or school)."</i>	FA
Other-Directedness	10. Entitlement/ Grandiosity	<i>"I hate to be constrained or kept from doing what I want."</i>	ET
	11. Insufficient Self-Control/ Self-Discipline	<i>"I can't force myself to do things I don't enjoy, even when I know it's for my own good."</i>	IS
	12. Subjugation	<i>"I have a lot of trouble demanding that my rights be respected and that my feelings be taken into account."</i>	SB
Overvigilance & Inhibition	13. Self-Sacrifice	<i>"I'm the one who usually ends up taking care of the people I'm close to."</i>	SS
	14. Approval-Seeking/ Recognition-Seeking	<i>"Lots of praise and compliments make me feel like a worthwhile person"</i>	AS
	15. Negativity/ Pessimism	<i>"You can't be too careful; something will almost always go wrong "</i>	NP
	16. Emotional Inhibition	<i>"I find it embarrassing to express my feelings to others."</i>	EI
	17. Unrelenting Standards/ Hypercriticalness	<i>"I must meet all my responsibilities."</i>	US
	18. Punitiveness	<i>"I often think about mistakes I've made and feel angry with myself "</i>	PU

### 2.2.2.4 Schema modes and coping styles

EMS is maintained in the following coping styles: surrendering (the schema is repeated in life situations – an abused child selects an abusive partner in adulthood); overcompensating (the schema is rejected by doing the opposite– an abused child becomes an abuser in adulthood; a patient with VH EMS starts parachuting or mountain climbing); avoiding (any contact likely to trigger the EMS is avoided – the abused child will not trust anyone in adulthood). The individual may use all these coping styles in different situations (Young 1999). These coping styles have subsequently been

defined by introducing the schema mode concept. The schema mode means *'those schemas or schema operations – adaptive or maladaptive – that are currently active for an individual'* (Young et al. 2003, p. 37). Young et al. (2003) identified ten schema modes which are grouped into four categories: Child modes (vulnerable child, angry child, impulsive/undisciplined child, happy child); Maladaptive coping modes (compliant surrender, detached protector, overcompensator); Maladaptive parent modes (punitive parent, demanding parent) and the Healthy Adult Mode, which is the goal of the mode work in schema therapy. The detached protector mode (DePro) is a defensive wall to detach the patient from overwhelming affect arising, for example, from abuse or neglect. The coping style of DePro is psychological withdrawal and it may e.g. manifest as 'workaholism', unemotionality, numbness, over-intellectuality and compliance. It may also manifest as the most normal personality without any problems. The Emotional Deprivation schema is very commonly presented in DePro mode (Young et al. 2003). Lobbestael et al. (2005) introduced more schema modes in their study, e.g. Bully/Attack mode, which was associated with antisocial PDs. Different PDs have been shown to be associated with idiosyncratic mode combinations in a large study (N=489) by Lobbestael et al. (2008). Also, Bamelis et al. (2011) demonstrated associations between different PDs and certain schema modes.

#### 2.2.2.5 Childhood trauma, Schema Domains and EMSs

Several studies have demonstrated the association between different childhood adversities and certain EMSs or schema domains. In the study by Specht et al. (2009), miscellaneous childhood trauma (physical, sexual and emotional abuse, neglect and lack of emotional support) were associated with Disconnection & Rejection and Impaired Limits schema domains. All the schemas belonging to the Disconnection & Rejection schema domain and Entitlement/ Grandiosity (ET) EMS were significantly elevated in abused women with depression (Cukor and McGinn 2006). Thimm showed (2010a) that paternal rejection was associated with Disconnection & Rejection, Autonomy & Performance and Impaired Limits schema domains and maternal rejection with Disconnection & Rejection, Autonomy & Performance and Other-Directedness schema domains; lack of maternal emotional warmth was associated with Disconnection & Rejection schema domain.

The psychological maltreatment or abuse of a child has been shown to predict Mistrust/Abuse (MA), Abandonment/Instability (AB), Defectiveness/Shame (DS), Self-Sacrifice (SS), ET, Insufficient Self-Control/ Self-Discipline (IS) and Emotional Inhibition (EI) EMSs (Crawford and Wright 2007, Messman-Moore and Coates 2007). In the studies by Hartt and Waller (2002), Cecero

et al. (2004), Wright et al. (2009) and Carr and Francis (2010), childhood emotional abuse was shown to predict MA, Emotional Deprivation (ED), DS, Vulnerability to Harm or Illness (VH), EI and SS EMSs. Childhood emotional neglect was shown to predict MA, ED, DS, Social Isolation/Alienation (SI), VH, EI and SS EMSs. Childhood sexual abuse was associated with MA, ED, DS, SI, VH, EI and Subjugation (SB) EMSs (Hartt and Waller 2002, van Hanswijck de Jonge et al. 2003, Carr and Francis 2010). Childhood physical abuse was associated with ED (Hartt and Waller 2002).

#### *2.2.2.6 Attachment styles, Schema Domains and EMSs*

Certain EMSs seem to be associated with certain attachment styles (AB preoccupied; SI and ED dismissing; MA fearful attachment style; Cecero et al. 2004). Disconnection & Rejection and Other-Directedness schema domains were shown to be associated with preoccupied and Disconnection & Rejection schema domain with dismissing avoidant attachment dimensions (Bosmans et al. 2010). Mason et al. (2005) showed that the fearful and preoccupied attachment style groups possessed significantly more EMSs than the secure or dismissing groups. The fearful and preoccupied attachment style groups did not emerge as significantly different from each other in any of the EMSs. Visual analysis revealed that the fearful group had the highest scores. The fearful group was characterized by greater SI, DS and EI EMSs and the preoccupied group by AB, SB and ED EMSs. The secure group was characterized by lower scores in ED, AB, MA, DS, SI (Disconnection & Rejection schema domain), and Enmeshment/Undeveloped Self (EM), SB, EI and Dependence/Incompetence (DI) EMSs. The study by Simard et al. (2011) corroborates the predictive effect of insecure attachment in childhood (insecure ambivalent child attachment) to the development of EMSs.

#### *2.2.2.7 EMS assessment*

In schema-focused therapy (SFT), it is important to detect, measure and modify the EMSs. The therapist begins to form connections among specific symptoms, emotions, life problems and EMSs. The schemas can be detected in the way a patient describes his/her present-day problems, what he/she recounts about his/her life history and childhood. The way the patient takes his or her place in the relationship with the counsellor may reveal specific EMS activity or EMS driven behaviour (Young 1999, Young et al. 2003).



### ***2.2.2.7.1 Young Schema Questionnaire***

In order to measure the EMS activity the Young Schema Questionnaire (YSQ) was developed. There are currently several different long versions: YSQ, 15 EMSs, 123 items (Young and Brown 1989); YSQ-L, 16 EMSs, 205 items (Young and Brown 1994); YSQ-L3, 18 EMSs, 232 items (Young and Brown 2003a). In 1998, Young developed a less unwieldy measure, YSQ Short Form (YSQ-S), consisting of 15 EMSs and 75 items extracted from the most loading items on the YSQ-L. The short versions of the YSQ now available are: YSQ-S, 15 EMSs, 75 items (Young 1998); YSQ-S2, 15 EMSs, 75 items (Young and Brown 2003b); YSQ-S3, 18 EMSs, 90 items (Young 2005). Several studies have subsequently analysed the psychometric properties of the various YSQs. The 15-factor structure was replicated in two studies (Waller et al. 2001, Welburn et al. 2002). The factor structure of the YSQ-S or YSQ-L has been approved in many different languages, e.g. English, Korean, Dutch, Norwegian and Spanish (Schmidt et al. 1995, Calvete et al. 2005, Hoffart et al. 2005, Baranoff et al. 2006, Rijkeboer and Bergh 2006). Confirmatory factor analyses (CFA) for the YSQ-S (15 EMSs; Calvete et al. 2005, Baranoff et al. 2006) and YSQ-L (16 EMSs; Rijkeboer and Bergh 2006) have supported 13, 15 and 16 factor structures. Theoretical development, EFA and CFA have proposed three (Schmidt et al. 1995, Calvete et al. 2005), four (Lee et al. 1999, Cecero et al. 2004), five (Young 1999) and six (Young 1990) higher order factors - schema domains - which represent important parts of the unmet core needs of the child.

### ***2.2.2.7.2 The congruence between the hypothesized schema domains and empirical exploratory factor analyses (EFA) of EMSs***

The first EFA study (1,129 undergraduate students, divided into two split samples; Schmidt et al. 1995) included 16 theoretically hypothesized schemas. The Young Schema Questionnaire used (referred to as YSQ, Young 1990, 1991), included Negativity/Pessimism (NP) and Social Undesirability (SU) EMSs (the latter of which no longer exists in schema theory or in the latest YSQs). To test the item pattern, Schmidt et al. (1995) used principal component analysis (PCA) and Varimax rotation and obtained 17 factors in sample I, of which 15 were these hypothesized 16 EMSs. SU EMS did not emerge and some of the items loaded on other factors (SU->DS, SI ->ED and SB -> DI). In sample II, 13 factors were clearly replicated. The two split undergraduate samples were then combined, the inter-correlation matrix of these 13 first-order schema factors was calculated and factor analysed. Three second-order schema factors emerged.

Lee et al. (1999) performed a new EFA with probably the same YSQ (this time referred to as Young and Brown 1991; not mentioned in the references of that study) as in the study by Schmidt et al. (1995). The names of some EMSs had changed, some new ones had been introduced (e.g.

Social Isolation/Alienation) and some had disappeared (NP). They performed their study with a clinical population (n= 433). They used PCA and Varimax rotation and obtained 16 factors. Emotional Inhibition items loaded on two new EMSs, namely Fear of Loss of Control and Emotional Constriction. SU EMS loaded on SI (which was not in the list of hypothesized EMSs by Young, please see Schmidt et al. 1995, p. 297). In the same manner as described by Schmidt et al. (1995), a correlation matrix based on these 16 first order schema factors was calculated and factor analysed. Four second-order schema factors emerged. The factors retained did not reflect the best practices of EFA (Hatcher 1994, Thompson 2004, Costello and Osborne 2005), as there were only two EMSs in two different factors and many of the EMSs loaded simultaneously on two second-order factors, namely Subjugation, Defectiveness, Mistrust, Abandonment, Unrelenting Standards (please see Table 1 in Lee et al. 1999, p.445). Probably PCA is not the best way to find underlying latent factors, as according to some authors it is not a true factor analysis but a component analysis best suited to sorting out items from larger measures (e.g. Hatcher 1994, Thompson 2004). Varimax rotation (orthogonal) may have better repeatability but it is ill-suited to the analysis of higher order schema factors as they have been shown to be highly correlated (Hoffart et al. 2006).

The third second-order schema factor study (Cecero et al. 2004) used EMSQ-R (Early maladaptive schema questionnaire-research version) with 292 undergraduate participants. EMSQ-R was based on YSQ-S (Young 1998) and had rewritten items so as to be understandable by laymen and some items were also reversed. Items were factor analysed and 14 schema factors emerged. Using the factor correlation matrix generated from the 14 first-order schema factors, an EFA analysis was undertaken and four second-order factors emerged. One factor (#3) was constituted from only one EMS and in three EMSs overlapping on two higher order factors was seen, which does not reflect the best practices of EFA (e.g. Hatcher 1994).

The fourth second-order EMS study was performed by Calvete et al. (407 Spanish undergraduate students, mean age 22 years, ratio of men/women=18%/82%; 2005). They used YSQ-S with 15 EMSs. They performed EFA with PCA and Varimax rotation to test their confirmatory factor analysis hypothesis. The screetest supported a three-factor model. The three components emerged, consisting of (#1) FA, DI, EM, VH, IS, AB, SB; (#2) EI, ED, SI, DS, MA and (#3) Unrelenting Standards/ Hypercriticalness (US), SS, ET schemas. They also stated that SB and DS EMSs cross-loaded on two components with higher than .40 loadings.

All the aforementioned EFA studies were based on the older versions of YSQs comprising 15 or 16 EMSs. In light of the foregoing it seems that the five hypothesized schema domains suggested (Young 1999, Young et al. 2003) are yet to be confirmed by empirical studies. Statistically, maybe, there should be even more EMSs for those five schema domains to emerge.

#### *2.2.2.8 The association between EMSs or schema domains and different disorders or symptoms*

Reeves and Taylor (2007) used DSM-IV Axis -II Personality Questionnaire (Semistructured Clinical Interview for DSM-IV; SCID-II-Q, First et al.1994) and YSQ-SF in a large non-clinical sample and showed that Cluster A (paranoid, schizoid and schizotypal personality types) were associated with MA, SI and EI EMSs; Cluster B (antisocial, borderline, histrionic and narcissistic personality types) were associated with MA, SI, ET, IS, EM and EI EMSs and Cluster C (avoidant, dependent, depressive, obsessive-compulsive and passive-aggressive personality types) were associated with AB, MA, SI, ET, IS, VH, EM, EI and US EMSs. Thimm (2010a) showed with mediational analyses that Cluster A is predicted by Disconnection & Rejection schema domain, Cluster B by Disconnection & Rejection and Impaired Limits schema domains and Cluster C by Disconnection & Rejection schema domain. Specht et al. (2009) showed that Disconnection & Rejection and Impaired Limits schema domains predicted borderline personality disorder severity among incarcerated women. In another study among 442 students (Zeigler-Hill et al. 2011), all subgroups of narcissism were predicted by ET EMS. Among the different subscales of narcissism, MA, AB, DS, ED, DI, SS, EI, EM, US and ET EMSs were significant predictors. Emotional Inhibition (EI), SB and AB EMSs were shown to mediate (and thus predict) avoidant personality disorder (Carr and Francis 2010). (Table 2)

Symptoms of anxiety and depression were associated with VH, DS and SS EMSs among college students in a study by Wright et al. (2009). More specifically, Calvete et al. (2005) showed that anxiety was associated with AB, FA and SB EMSs and anger with ET, IS and MA EMSs in undergraduate students. In the study by Schmidt et al. (1995) VH, Incompetence/ Inferiority (DI) and EI EMSs predicted anxiety. (Table 2)

YSQ total score has been shown to predict depressive symptoms (Thimm 2010b). Of the individual schema domains, Impaired Autonomy and Disconnection predicted depression and even asymptomatic, previously depressed subjects had higher scores on them than never depressed (Hoffart et al. 2005). Halvorsen et al. (2009) showed that Disconnection (MA, SI, ED, AB), Impaired Autonomy and Restricted Self-Expression (EI, SS, US) predicted concurrent depression severity in a sample of previously depressed, clinically depressed and never depressed control participants.

Of the individual EMSs, AB, DS, FA, IS, DI and SS have been associated with depressiveness (Schmidt et al. 1995, Glaser et al. 2002, Harris and Curtin 2002, Calvete et al. 2005, Baranoff et al. 2006). Wang et al. (2010) argued that DI and SB EMSs are mood sensitive in different states of depression rather than being predisposing vulnerability factors. Stopa and Waters (2005) showed

that ED and DS scores increased after depressed mood induction, whereas ET scores increased after happy mood induction. Suicide risk variables were most highly correlated with the SI, DS and FA EMSs, suggesting that these schemas may distinguish individuals at particularly high risk for suicidal ideation and suicide attempts (Dutra et al. 2008). (Table 2)

In the study by Price (2007), DS, DI, EM and FA EMSs predicted PTSD symptomatology. Cockram et al. (2010) reported a good outcome of a group SFT among war veterans with post-traumatic stress disorder (PTSD). They argued that the relief of PTSD symptoms resulted mainly from the positive change in Impaired Autonomy schema domain (DI, VH, EM, FA EMSs).

Bamber and McMahon (2008) studied occupational stress and the association between different subgroups of stress and EMSs. They found that emotional exhaustion was related to ED EMS, depersonalization to SB and ET EMSs, reduced personal accomplishment to EI EMS and sickness absence to EM EMS. They also showed that there were bizarre correlations between different career choices and EMSs. Nurses had lower scores on US EMS and clinical psychologists had lower scores on ET EMS. Doctors had higher scores on EI EMS, nurses on VH and SS EMSs and IT-staff on DI EMS respectively.

The study by Anderson et al. (2006) indicated that obese adults had significantly higher schema total score and that the '*obese status*' ( $BMI \geq 30$ ) was associated with significantly higher scores on SI, DS and FA EMSs. Turner et al. (2005) measured the differences in EMS scores among two weight groups (female adolescents, BMI 27.8, SD 2.6 and BMI 20.2, SD 0.10) and found that the higher BMI group had significantly higher scores on ED, AB, SB, IS EMSs and on the YSQ total score. In a study among obese adolescents (Van Vlierberghe and Braet 2007), the overweight group displayed overall greater severity of dysfunctional schemas than the normal weight controls. The obese group scored significantly higher on the schemas ED, SI, DS, FA, DI and SB EMSs.

Leung and Price (2007) found that even after controlling for depression and self-esteem, a female eating disordered group (bulimia or anorexia nervosa) had a significant increase in all EMSs except ET (PU, AS and NP were not included in the study) when compared with a female control sample. Turner et al. (2005) divided adolescent girls into high and low groups of eating disorder symptoms. They found that the group with high scores on eating disorder symptoms had significantly higher values in all but SS EMS (PU, AS and NP were not included in the study). When studying dysfunctional schemas in overweight youth Van Vlierberghe et al. (2009) found that the 'loss of control over eating' group had a significant increase in AB, MA, SI, FA, SB and US EMSs. Thus it seems that eating disorders are associated with high rates of increased EMSs. (Table 2)

In the study by Broatch et al. (2004), a clinical substance abuse group and a non-student control group were used to measure the differences in EMSs among the groups with opiate/alcohol, opiate or alcohol abuse. Combined opiate/alcohol abusers had high levels of EI EMS; both groups that abused alcohol had high levels of SB and VH EMS beliefs. Alcohol abuse was characterized by the highest level of cognitive pathology.

**Table 2.** Association between EMSs or schema domains and different disorders or symptoms (results from the studies discussed in subsection 2.2.2.8)

Schema Domains and EMSs	Borderline	Cluster A	Cluster B	Cluster C	Narcissism	Depression	Anxiety	Eating disorders
<b>Disconnection &amp; Rejection</b>	D&R	D&R	D&R	D&R		D&R		
1. Abandonment/Instability				AB	AB	AB	AB	AB
2. Mistrust /Abuse		MA	MA	MA	MA			MA
3. Emotional Deprivation					ED			ED
4. Defectiveness/Shame					DS	DS	DS	DS
5. Social Isolation/Alienation		SI	SI	SI				SI
<b>Impaired Autonomy &amp; Performance</b>						I&P		
6. Dependence/Incompetence					DI	DI	DI	DI
7. Vulnerability to Harm or Illness				VH			VH	VH
8. Enmeshment/Undeveloped Self			EM	EM	EM			EM
9. Failure						FA	FA	FA
<b>Impaired Limits</b>	IL		IL					
10. Entitlement/Grandiosity			ET	ET	ET			ET
11. Insufficient Self-Control/ Self-Discipline			IS	IS		IS		IS
<b>Other-Directedness</b>								
12. Subjugation				SB			SB	SB
13. Self-Sacrifice					SS	SS	SS	SS
14. Approval-Seeking/ Recognition-Seeking								
<b>Overvigilance &amp; Inhibition</b>								
15. Negativity/Pessimism								
16. Emotional Inhibition		EI	EI	EI	EI		EI	EI
17. Unrelenting Standards/ Hypercriticalness				US	US			US
18. Punitiveness								

## 2.3 Conclusions based on the literature reviewed

Pain is a personal experience. Acute pain perception, as we all have learned, is almost proportional to the extent of the tissue damage. Chronic pain is a syndrome or disease which persists after the body processes (e.g. after the injury) should have healed. Worldwide, chronic pain affects approximately one third of adults. As the biomedical models of pain have failed to offer methods to cure the 'pain disease' a biopsychosocial model of pain has been introduced. According to this, pain is a multidimensional experience which can both be influenced by biopsychosocial factors and also produce biological, psychological and social changes, which again, may affect future responses to pain.

The transition from acute to chronic pain is predisposed by a huge nociceptive input, earlier history of pain, increasing age, psychosocial factors like job dissatisfaction, distress and depression among other things. The CNS is widely engaged in pain perception. However, the pain perceiving areas are somewhat different in acute and chronic pain states. The CNS is artificially divided into lateral and medial nociceptive systems, the latter of which is more engaged in chronic pain. In chronic pain states, it is important to understand that the extent of the injury or disease (e.g. degenerative arthritis), the afferent (bottom-up) nociceptive data and the pain perceived are not in a linear relationship. The CNS has many procedures which can modulate the pain perception. For example, depression and early adversities can trigger catastrophic beliefs and anxiety, which can up-regulate the pain perception. However, good abilities to make cognitive reappraisals of the situation, distractive behaviour, relaxation, happy mood and good social relations can down-regulate the pain experience. There are efferent (top-down) processes, which can inhibit or facilitate the pain perception but these may deteriorate as the pain disease persists.

Some chronic pain patients succumb to many restrictions and limitations in their daily lives. Pain factors, age, depression, emotional distress, fear of movement beliefs, poor social support and passive coping strategies are among the factors inducing pain disability. It has been shown that there may be a disconnection between the perceived disability and the objectively measured functional deficit. Return of function is one of the most important goals in pain therapy. However, there is ambiguous evidence about the predictive factors for pain disability.

Schema-focused therapy (SFT) is based on cognitive therapy and uses as an instrument so called early maladaptive schemas (EMS) and schema modes. If the needs (nurture, safety, love, understanding and acceptance) of the child are neglected he or she develops adaptive schemas for

that life situation in order to cope and survive. Later in life they become maladaptive, so called EMSs. EMSs refer to extremely stable and enduring themes that are elaborated upon throughout an individual's lifetime. There are 18 EMSs in 5 hypothesized schema domains. EMSs are assessed from the patients' symptoms, life problems and stories and with the Young Schema Questionnaire. However, there are neither statistical studies confirming the contemporary 18-factor EMS structure, nor the hypothesized five factor second-order schema-domain-structure. There are no prevention studies measuring EMS occurrence. However, it has been shown that EMS and schema domain activity are associated with insecure attachment and early traumatization and also with the personality traits of neuroticism, low extraversion, low agreeableness, low conscientiousness and low self-directedness.

SFT was first developed to treat personality disorders (PD). During the last two decades, SFT has been applied to PDs, depression, eating disorders and post-traumatic stress disorder. However, to the best of my knowledge, no EMS studies appear among the so-called medical diseases. We do not know if chronic pain patients have certain EMSs which predispose them to chronic pain, disability or depression. Also, the 18 EMSs offer us a good standpoint to uncover psychic shapes that may induce patterns of behaviour which reduce or increase pain, depression or disability.

Chronic pain is linked to early adversities, depression and personality disorders (PD). Early emotional, physical and sexual abuse will increase the risk of pain chronicity. EMSs have been shown to reflect early adversities. Depression played a role in as many as half or three thirds of chronic pain patients. Also, PDs may be present at over a half of chronic pain patient cases. Thus, those who work with chronic pain patients should be prepared to confront a variety of affective problems and behavioural difficulties which may even pull them to troubled transactional roles. As the early maladaptive schemas (EMS) reflect early traumatization, they may evidence the tie-in of early adversities with depression and thus offer new insights on the treatment of depression among chronic pain patients. EMSs may lead us to perceive and understand the difficult transactional roles in pain patient care and thus help us to better manage the often difficult pain therapy process. In the same manner as the altered representation of the body map on the somatosensory cortex may increase pain, the altered and maladaptive representation of one's self (EMS) may increase 'affective pain'. The role and effect of EMSs on pain, depression and pain disability among sufferers of pain has never been assessed. As a statistical method, Lisrel analysis offers more possibilities than the conventional linear regression analysis to identify mediative and predictive factors and to draw paths between different measures.



### 3. Aims of the study

The aims of the present dissertation were as follows:

- 1) To confirm the structural model of the Young Schema Questionnaire (short form) with all 18 schemas in the Finnish language version among chronic pain patients and a control group. Study I
- 2) To examine the presence of early maladaptive schemas and schema driven behaviour in a chronic pain patient sample and to investigate the relationship between these schemas and different pain variables. Study II
- 3) To investigate and compare EMSs and schema domains among chronic pain patients and control participants and to ascertain how EMSs and schema domains are connected with different pain variables. Study III
- 4) To ascertain if chronic pain patients show a latent factor structure (underlying psychic pattern) different from control participants. To examine if the latent factors predict pain or depression. Study IV
- 5) To confirm if pain intensity, pain disability, early maladaptive schema factors and depressiveness are related together in the same manner or differently in the pain patient and control samples. To ascertain if the duration of pain has an effect on the relationship between these variables in the pain patient group. Study V

## 4. Material and Methods

### 4.1 Study design and subjects

#### 4.1.1 Design

The present study is part of a larger study entitled '*The survey of the psychic profile of pain patients*'. The data was collected from January 2004 to March 2005. The pain patients (N=271) in the study were chronic, first visit pain patients in six pain clinics in central and northern Finland and the control participants (N=331) were municipal employees of Raahen town administration. The study method used was a cross-sectional questionnaire and interviews.

#### 4.1.2. Subjects

From six pain clinics in central and northern Finland consecutive 18 – 64 year old first-visit pain patients were recruited to take part in a study for one year (January 2004-2005). Sources of referral included primary health care and various medical specialists. The patients were informed in advance about the study protocol by letter. Every patient attending the pain clinic received the questionnaire used for data collection. A clinical nurse provided assistance if a patient had problems in completing the questionnaire. Of 318 eligible patients, 271 participated. All these patients were suffering from non-malignant, daily, chronic pain lasting 3 months or longer (International Association for the Study of Pain 1986). The typical pain diagnoses were sciatica, arthrosis and neuropathic pain. (Studies I-V)

One hundred and three of the aforementioned participants in one pain clinic were interviewed semi-structurally according to the cognitive case formulation: all their pain and other symptoms; thoughts about their pain disease, self, others, the world and the future; emotions concerning their pain and life situation; changes in their behaviour concerning work, hobbies and social relations were elicited, tape-recorded and transcribed. (Study II)

The control group was recruited from the employees of Raahe town administration (n=918; women n=728; men n=190). In attempting to match the groups the inclusion criterion in the control group was age 18 - 64 years. All the municipal employees were informed beforehand by electronic weekly bulletin that a control group for a pain study was needed and that everyone would receive a questionnaire to complete within one month (March 2005). They were also informed that the study was based on total anonymity and free will. A total of 331 control individuals participated in the study. (Studies I, III, IV). Among the 331 controls there were 55 participants without pain, who were excluded from the analyses and the remaining 276 painful controls served as a painful control group in Study V.

#### *4.1.2.1 Baseline socio-demographic characteristics*

The pain patient group (Table 3) had a mean age of 47.0 years (SD 9.3 years; range 18-64 years) and consisted of 127 males (47%) and 144 females (53%). The mean age of the control group (Table 3) was 47.4 years (SD 9.5 years; range 19-62 years). This group consisted of 40 males (12.1%), 284 females (85.8%) and 7 (2.1%) with sex not reported. The mean duration of education was 11.4 years (SD 1.7 years; range 9-18 years) in the pain patient group and 13.2 years (SD 2.9 years; range 10-18 years) in the control group. The duration of education was estimated from the occupation. The pain and control groups were found to be comparable in age. However, the groups did differ highly significantly in their gender distribution ( $\chi^2=87.1$ ;  $p<0.001$ ) and in the duration of education ( $t=10.6$ ;  $p<0.001$ ). The response rate in the pain patient group was high (N=268 out of 271 participants in all parameters). The response rate in the control group was lowest for age (N=304 out of 331 participants) and for the duration of pain (319/331). For the rest of the pain variables, EMS and schema domain data it was high (N=322 out of 331 participants).

#### *4.1.2.2. Baseline pain and depressiveness characteristics*

In depressiveness and in all pain variables, the pain patient and the control groups differed highly significantly ( $p < 0.001$ ). There were 54 control participants (16.3%) who had no pain and the mean pain intensity was mild (VAS=2.8) in the control group and severe (VAS=5.9) in the pain patient group. The mean duration of pain was 2.4 years in the control group and 9.3 years in the pain patient group. Mean numbers of pain sites were 1.4 and 2.1 respectively. Pain disability was rated “mild” (PDS=5.1) in the control group and “remarkable” (PDS=16.5) in the pain patient group.

Depressiveness was rated “*minimal*” (BDI-II=6.9) and “*mild*” (BDI-II=15.7) respectively (Table 3).

The 271 chronic pain patients reported the sites of pain as follows: head and face 13%, neck and shoulder 52%, low back pain 68%, extremity 44%, thorax 13% and abdominal pain 23%. The 276 painful control participants (Study V) reported the sites of pain as follows: head and face 21%, neck and shoulder 44%, low back pain 38%, extremity 53%, thorax 7% and abdominal pain 8%.

*Table 3.* Age, gender, duration of education, pain variable and depressiveness statistics in the pain patient and control groups.

variable	Pain patient group			Control group			Significance
	M	SD	Range	M	SD	Range	p
Age	47.0	9.3	18-64	47.4	9.5	19-62	0.60
Gender (Male/ Female) <sup>1</sup>			127/144			40/284	<0.001*
Duration of education in years	11.4	1.7	9-18	13.2	2.9	10-18	<0.001‡
Mean pain intensity (VAS)	5.9	1.2	2.5-9.5	2.8	2.0	0-8.3	<0.001†
Duration of pain in years	9.3	8.8	0.25-36	2.4	2.4	0-6	<0.001†
Number of pain sites	2.1	1.3	1-6	1.4	1.2	0-5	<0.001†
Pain disability scale	16.5	5.1	3-27	5.1	4.7	0-22	<0.001†
Depressiveness (BDI-II)	15.7	10.1	0-50	6.9	6.7	0-35	<0.001†

Notes:

\* =Chi-square test

‡ =Student's *t*-test

† = Mann-Whitney U-test

VAS= Visual Analogical Scale

BDI-II=Beck Depression Inventory –2<sup>nd</sup> edition

<sup>1</sup> = In the control group gender was not reported in 7 cases

## 4.2 Measures

### 4.2.1 Pain

#### *4.2.1.1 Pain localization, duration and intensity*

A pain map was used to localize all pains. There was one front view and one rear view on which to draw the pain sites. The duration of all chronic pain was elicited and a grid was offered to mark pain for consecutive decades. The current pain intensity was measured with two 10-cm Visual Analogue Scales (VAS; McDowell and Newell 1996). On the first VAS (pain max) patients were asked to rate their maximal experienced pain (0= “no pain” to 10= “worst pain one can imagine”) and on the second VAS (pain min) their minimal experienced pain (0= “no pain” to 10= “worst pain one can imagine”). Pain intensity was the mean of pain max and pain min.

#### *4.2.1.2 Pain disability*

The Pain Disability Scale (PDS) in this study was based on a pain disability scale used in most of the pain clinics in northern Finland. The Pain Disability Index (PDI) (Pollard 1984, Tait et al. 1987) is a reliable measure of pain disability (Grönblad et al. 1994, Tait and Chibnall 2005). Culturally and geographically, however, the study populations lived in a rather different atmosphere than where the PDI was developed and tested (St. Louis, USA). We therefore felt obligated to conduct a pilot study with 103 pain clinic outpatients (A. Saariaho and T. Saariaho, unpublished data). The pain patients perceived strange expressions in items #1 (e.g. driving the children to school), #3 (e.g. parties, theater, concerts, dining out), #4 (e.g. housewife or volunteer worker) and #7 (Life-Support Activity) in PDI. The correlation between PDS and PDI was high ( $r=.81$ ) and both PDS and PDI were strongly associated with BDI-II ( $r=.56$  and  $r=.58$  respectively) and pain intensity (VAS,  $r=.62$  and  $r=.62$  respectively). The results of this pilot data supported the use of PDS in this cultural setting to estimate pain disability.

The Pain Disability Scale (PDS) was developed for this study. It is a 9-item self-report scale consisting of seven direct statements: “My pain is disturbing my sleep”, “... my hobbies”, “... my sex life”, “... my work”, “... my ability to move”, “... my economy”, “... my social contacts”, and two inverted statements: “I can enjoy life despite my pain”, “I can control my pain”. All the items

were self-reported on a 4-point Likert-type scale: 0 = not at all; 1 = to some extent; 2 = significantly; 3 = very much. The total score (range 0-27) reflects the overall level of pain disability. A score of 0-4 indicates 'no disability', a score of 5-13 'mild disability', a score of 14-22 'remarkable disability' and a score of 23-27 'severe disability'. The reliability of the PDS was estimated in both samples by computing Cronbach's alphas. The lowest acceptable alpha value can be regarded as 0.70. The alphas for the PDS scales were 0.83 in the pain patient group and 0.89 in the control group. In both cases the alpha levels were well above 0.70, indicating adequate reliability.

#### 4.2.2 Early maladaptive schemas

Both groups completed the Finnish version of the extended Young Schema Questionnaire - short form (=YSQ-S2-extended, Appendix). It consists of two parts as follows:

- 1) YSQ-S2 is a 75 -item self-report, likert-type questionnaire (Young and Brown 2003b), where a value of 1 means "Completely untrue of me" and a value of 6 means "Describes me perfectly". Higher values describe stronger schema valence and a more maladaptive core belief. Every EMS consists of five items. Also, if two or more of these five items are rated 5 or 6, the patient has a meaningful schema ([www.schematherapy.com/id111.htm](http://www.schematherapy.com/id111.htm)), which signifies that the schema exists and is of importance in the patient's life and may have an effect on behaviour (Young et al. 2003). The YSQ-S2 is designed to assess 15 EMSs and to provide a total score reflecting the level of each EMS. The 15 subscales are as follows: Emotional Deprivation = ED, Abandonment/ Instability = AB, Mistrust/ Abuse = MA, Defectiveness/ Shame = DS, Social Isolation/ Alienation = SI, Dependence/ Incompetence = DI, Vulnerability to Harm or Illness = VH, Enmeshment/ Undeveloped self = EM, Failure = FA, Entitlement/ Grandiosity = ET, Insufficient Self-control/ Self-discipline = IS, Subjugation = SB, Self-sacrifice = SS, Emotional Inhibition = EI, Unrelenting standards/ Hypercriticalness = US. The construct validity (Welburn et al. 2002) and reliability of YSQ-S2 in clinical and research use (Waller et al. 2001) have been established.

- 2) When the data collection started (2004) the theoretical development of SFT was proposed to be composed of 18 EMSs but there was no short version of the YSQ

available including all 18 EMS subscales (the 15 EMSs already mentioned and Approval-seeking/ Recognition-seeking = AS, Negativity/ Pessimism = NP, Punitiveness = PU; Young et al. 2003). We (A. Saariaho and T. Saariaho) therefore made a pilot study with a different pain patient sample which completed all the AS, NP and PU EMS items from the YSQ-L3a (Young and Brown 2003a) Finnish version. The mean of every item was calculated and the five highest valued items from every subscale were included in the YSQ-S2-extended as follows (in parentheses there is a reference of the 7 EMS items which are included in the YSQ-S3; Young 2005):

*“It is important to me to be liked by almost everyone I know” (AS76)*

*“Accomplishments are most valuable to me if other people notice them” (AS77)(YSQ-S3-item #34)*

*“I find it hard to set my own goals, without taking into account how others will respond to my choices” (AS78)*

*“When I look at my life decisions, I see that I made most of them with other people’s approval in mind” (AS79)*

*“Lots of praise and compliments make me feel like a worthwhile person” (AS80) (YSQ-S3-item #88)*

*“Even when things seem to be going well, I feel that it is only temporary” (NP81) (YSQ-S3-item #17)*

*“If something good happens, I worry that something bad is likely to follow” (NP82) (YSQ-S3-item #35)*

*“You can’t be too careful; something will almost always go wrong” (NP83) (YSQ-S3-item #53)*

*“I focus more on the negative aspects of life and of events than on the positive” (NP84)*

*“People close to me consider me a worrier” (NP85)*

*“If I don’t try my hardest, I should expect to lose out” (PU86) (YSQ-S3-item #36)*

*“There is no excuse if I make a mistake” (PU87)*

*“People who don’t “pull their own weight” should get punished in some way” (PU88)*

*“If I don’t do the job, I should suffer the consequences” (PU89) (YSQ-S3-item #54)*

*“I often think about mistakes I’ve made and feel angry with myself” (PU90)*

The original English version of the YSQ-S2 has been in clinical use in Finland for several years and the 15 aforementioned additional items (AS, NP, PU) were translated into Finnish by a group of counsellors and the whole questionnaire was back-translated blind into English by another bilingual group. An authorised translator checked the original and back-translated versions. A group of counsellors then assessed both the syntax and the cultural interpretations of each item. The original items appeared in the same order as in the YSQ-S2.

The abbreviation YSQ-S2-extended refers in this text to this Finnish version with 18 EMSs and 90 schema items.

### 4.2.3 Depressiveness

The assessment of depression among chronic pain patients poses a problem because of the symptom overlap between depression and chronic pain. The Beck Depression Inventory (BDI; Beck et al. 1961, 1979) is one of the most popular self-report scales, and designed to measure the intensity of depressive symptoms in psychiatric populations. However, the BDI has been criticized for being too sensitive to the somatic symptoms of chronic pain patients and hence, misleading by yielding excessive presence of depressiveness (Williams and Richardson 1993). More specifically, Morley et al. (2002) concluded that the BDI cannot measure depression in chronic pain patients. On the other hand, among Finnish pain patients (Kuusinen 2004), the BDI was shown to be a reliable measure to assess depressiveness. Kuusinen (2004) supported the use of both factors of BDI (i.e. BDISOM and BDIPSY) in assessing depression among chronic pain patients.

The Beck Depression Inventory-Second Edition (BDI-II, Beck et al. 1996) is a revision of the BDI. The original version was revised to reflect the diagnostic criteria of the Diagnostic and Statistical Manual for Mental Disorders-Forth Edition (American Psychiatric Association, 1994). Three studies have tested the psychometric properties of the BDI-II among chronic pain patient samples (Poole et al. 2006, Harris and D'Eon 2008, Corbière et al. 2011). Poole et al. (2006) used both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) with a split sample method in a total of 1227 chronic pain patients. They confirmed a two-factor model, namely '*negative thoughts*' and '*behaviour*' with 18 items (the items pessimism, appetite changes and interest in sex were not included in the model). They suggested that chronic pain patients have a different pattern of item endorsement from psychiatric patient groups. Chronic pain patients scored higher on the behaviour than on the negative thoughts factor. Harris and D'Eon (2008) confirmed a three-factor model, namely '*negative attitude*', '*performance difficulty*' and '*somatic elements*' with all 21 items included in the model. All the three aforementioned factors contributed to a second-order factor (BDI-II). Their results supported the use of the BDI-II for assessing depressive symptoms in both women and men with chronic pain. They too, found that chronic pain patients scored less on the cognitive symptoms of depression as depressed individuals without chronic pain. Corbière et al. (2011) confirmed a three-factor model of BDI-II (*cognitive, somatic and affective factors*) among chronic pain patients with musculoskeletal disorders. Importantly, patients receiving medical services for depression scored higher on every factor. Eighty percent of the participants gave 'pain' or 'pain and state of mind' as the perceived cause of depressive symptoms. They, too, suggested the use of all 21 items of the BDI-II in evaluating depression among chronic pain patients.



Depressiveness was assessed with the BDI-II, also validated in Finnish language (Beck et al. 2004). All the items were self rated from 0 to 3 and summed to get a score range from 0 to 63 and higher values indicating more severe depressive symptoms. A score of 0-13 indicates minimal depressiveness (the individual faces normal ‘ups and downs’), a score of 14-19 indicates mild, a score of 20-28 moderate and a score of 29-63 severe depressive symptoms. The results of the studies by Harris and D'Eon (2008) and Corbière et al. (2011) supported the use of BDI-II total score for assessing depressive symptoms.

## 4.3 Statistical methods

### 4.3.1 Study I

#### *4.3.1.1. Reliability and EMS distribution characteristics*

The reliability of the YSQ-S2-extended was estimated in both samples by computing Cronbach's alphas for individual EMS subscales. The lowest acceptable alpha value can be regarded as 0.70. The total EMS mean differed little but significantly ( $p < 0.05$ ) between the groups and the data of individual EMS subscales was moderately skewed and kurtotic in both groups.

#### *4.3.1.2. Factor Modeling*

The YSQ-S2-extended consisted of 90 items in 18 EMS subscales. As the confirmatory factor analysis (CFA) of the model with such a large number of items and latent factors was very complex, the CFA had to be made in several steps to confirm the model as follows (Leskinen 1987):

- 1) The original YSQ-S2 (75 items in 15 EMS subscales) was first analysed as such for all participants to see how the hypothetical latent structure of YSQ-S2 would appear, how the 75 individual schema items would load ( $\lambda_{1-75}$ ) and how the residuals ( $\theta_{1-75}$ ) would appear.
- 2) Then the three first schema subscales (ED, AB and MA) from the YSQ-S2 were arbitrarily excluded and the three 'new' subscales (AS, NP and PU) were included to be analysed in the same way as in analysis #1. This selection also made it possible to compare the individual subscale item loadings in 12 shared EMSs from analyses #1 and #2.

- 3) In the third analysis, all the 5 item loadings of each subscale from analyses #1 and #2 for all 18 EMSs were checked separately to put the loadings in order of magnitude from I (=strongest) to V (=weakest). Then the I and V strongest loadings and the II and IV strongest loadings were aggregated (the mean values of the original matrix of I-V and II-IV items were put into the original matrix) and the third strongest item (=III) was left unchanged (Little et al. 2002). Thus the new model consisted of two different parcel indicators and one single item indicator for each latent EMS factor (54 individual schema items and 18 latent EMS factors). The variances of each latent EMS factor ( $\omega_{1-18}$ ) were fixed to a value of one. In that way the first order factor structure could be analysed for the whole YSQ-S2-extended with 18 EMSs in the total sample.
- 4) Finally the 18 EMSs were divided arbitrarily into two separate parts to compare the model structure, individual item loadings and squared multiple correlations between the pain patient and control groups. The parts consisted of the odd EMSs (ED, MA, DS, DI, EM, SS, US, IS and NP) and the even EMSs (AB, SI, FA, VH, SB, EI, ET, AS and PU).

The diagonally weighted least squares estimation method (DWLS) and polychoric correlation matrix were used as the individual schema items were discrete, ordinal variables and in most cases the distribution was positively skewed.

#### *4.3.1.3. Fit indices*

As the models were relatively complex, several different fit indices were used to assess their goodness-of-fit. In situations where the number of cases is high, the  $\chi^2$  test is unreasonable. According to Mueller (1996),  $\chi^2$  was compared to the degrees of freedom and a rule of thumb for a good criterion of fit is  $\chi^2/df \leq 2$ . Root Mean Square Error of Approximation ( $RMSEA \leq 0.05$ ; Browne and Cudeck 1993), Goodness of Fit Index ( $GFI \geq 0.95$ ), Adjusted Goodness of Fit Index ( $AGFI \geq 0.90$ ), Standardized Root Mean Square Residual ( $SRMR \leq 0.05$ ; Jöreskog and Sörbom 1988) and Normed Fit Index ( $NFI \geq 0.95$ ; Bentler and Bonnet 1980) were used as indices for good fit of the models.

## 4.3.2 Study II

### 4.3.2.1 *Quantitative analysis*

Pearson's Chi-square was used in categorical variables and Student's *t*-test in normally distributed variables in group analyses between meaningful and non-meaningful EMS groups. To describe the schema distribution bar graphs were presented. The two most frequently occurring schemas in male and female chronic pain patients were sought. Linear regression analyses (enter method) were used to ascertain if age, duration of education and the most frequently occurring EMSs predicted pain intensity or if the aforementioned independent variables and pain characteristics predicted pain disability. As the kurtosis, skewness and histogram showed normal distribution of the dependent values and the residuals in the linear regression analyses also showed normal distribution, this method could be used. The word *predict* in this context refers to statistical association and not to real causality. Because the schema distribution differed in magnitude and order between men and women the analyses were conducted separately for both genders in the first two regression analyses.

### 4.3.2.2 *Speech analysis*

The tape-recorded and transcribed interviews were analysed by two cognitive psychotherapists (A. Saariaho and T. Saariaho). The schemas and the schema driven behaviour were expected to be found in the speech content where the patient was situated in a different position or relationship to one's self and disease, the health care system, work or other people. The schemas were identified according to their special features (Young et al. 2003). Special attention was paid to the schema driven behaviour related to pain disease. For the assessment, both readers had to agree on the interpretation of the content of the speech.

## 4.3.3 Study III

Socio-demographic, pain variable and EMS data were compared between the pain and the control groups. *Post hoc*, as there was a statistically significant difference in the distribution of gender, group comparisons were made between the sexes in the control and pain patient groups separately. The Fisher skewness and kurtosis coefficients showed a most non-normal distribution (outside  $|+/-1.96|$ ; Pett 1997, pp.35-40) in all other variables except in pain intensity and pain disability in the

pain patient group and SS EMS in the control group. The value of each schema domain was the mean of the respective schemas and the individual *EMS* values were the mean of the five respective schema items. Chi-square test was used with categorical data, Mann-Whitney U-test with non-normally distributed data and Student's *t*-test with normally distributed data. Spearman's correlation (*rho*) was used in non-normally distributed data. The association was regarded as small if *rho* was +/-0.1 - +/-0.29, medium if +/-0.30 - +/-0.49 and large if +/-0.50 - +/-1.0 (Cohen 1988). To see how different pain variables were connected to EMS and schema domain values, both groups (pain and control) were dichotomized in the following way (see Turner et al. 2005):

*Top group.* The top group consisted of the top 20% of sufferers (*n*=54 in the pain patient group; *n*=64 in the control group) of pain intensity, pain duration, number of pain sites or pain disability scale score.

*Bottom group.* The bottom group consisted of the bottom 20% of sufferers (*n*=54 in the pain patient group; *n*=64 in the control group) of the pain intensity, pain duration, number of pain sites or pain disability scale score. Thus there were 4 Top-Bottom pairs in the pain patient sample and 4 Top-Bottom pairs in the control group; (e.g. 54 pain patients scoring pain disability highest and 54 pain patients scoring pain disability lowest). The schema domain and EMS scale means between all the 8 Top-Bottom pairs were analysed with Mann-Whitney U-test for every one pair separately.

#### 4.3.4 Study IV

##### 4.3.4.1 Exploratory factor analysis, principles for factoring and variable [EMS] inclusion and exclusion criteria

*A priori*, a PCA analysis with Varimax rotation was conducted on the control sample with the same 15 EMSs as those used in the study by Calvete et al. (2005). The analysis suggested a three-component higher-order structure, which was identical in the order of components, total variance explained and almost identical in component structure and cross-loadings compared with the data by Calvete et al. (2005). The only significant difference was that although in both samples DS EMS loaded on two components with  $> |0.40|$  loading, it loaded mainly on component one in this study and on component two in the study by Calvete et al. (2005). This was deemed to warrant the study with 18 EMSs as follows.

To explore the structure of the higher order latent factors (schema factors=SF) 18 EMSs were subjected to exploratory factor analysis (EFA) with principal axis factoring (PAF), also called

common factor analysis, and to promax rotation. Oblique rotation (promax, kappa 4) was used as it could be expected that the EMS factors would correlate (e.g. Hoffart et al. 2005). Correlation matrices were used for the EFA. The subject to variable ratio was 15:1 and 18:1 in the pain patient and control groups respectively. The following criteria were used as guidelines for the EFA (Hatcher 1994, Thompson 2004, Costello and Osborne 2005): Cattell's Scree Test, Eigenvalue greater than 1.0, proportion of variance accounted for each factor more than 5%-10% and interpretability criteria (at least three variables with significant loadings on each retained factor, variables that load on a given factor share some conceptual meaning and variables loading on different factors seem to measure different constructs, and the rotated factor demonstrates simple structure). All EMSs that failed to load above |0.4| (pattern coefficient) on any factors or loaded on two or more factors above |0.4| were deleted. When the final factor structure was reached, the schema factor scores were computed for subsequent regression analyses with *save regression scores* command (SPSS 16.0; SPSS, Chicago, IL) according to Thompson (2004).

#### 4.3.4.2 Linear regression analysis

Linear regression analyses were used to explore how schema factors predict pain intensity and depression. To measure and detect a linear relationship between all variables, *a priori*, both the dependent and independent variables were plotted on a scatterplot and visually analysed for linearity. Whenever the bivariate distribution between the two variables is not absolutely linear, the *r* between those variables will be an underestimate of the magnitude of their relationship (Cohen et al. 2003). After the regression analyses, the residuals were saved and plotted against independent and predicted variables and their linear distribution was examined. To check for homoscedasticity the scattering of residuals was examined with dependent and predictor values. The normal distribution of the residuals was reviewed to approve the model (Cohen et al. 2003).

### 4.3.5 Study V

#### 4.3.5.1 Inclusion criteria and missing data imputation

First, controls free of pain (N=55) were excluded from further analyses. Among the painful controls there were 5 and among the pain patients 3 cases with more than 10% missing values of EMSs. They were excluded from the study. The remaining cases with missing values (N=2 in controls,

N=4 in pain patients) were treated with the expectation-maximization algorithm data imputation method (SPSS 16.0; SPSS, Chicago, IL) (Kline 2005; pp. 52-6). Thus, there were 271 painful control participants and 268 pain patients for the analyses.

To test the effect of duration of pain on the final pain model, the pain patient sample was data based grouped as follows: subgroup 1: Sixty-eight pain patients with the shortest duration of pain (0.25-2 years); subgroup 2: Sixty-eight pain patients with pain duration between 2.5 and 6 years and subgroup 3: Sixty-eight pain patients with the longest duration of pain (more than thirteen years). The mean age was significantly higher in subgroup 3 than subgroups 1 and 2 (51 years vs. 45 years). The number of pain sites was significantly higher in subgroup 3 than subgroup 1 (2.4 vs. 1.8). Pain disability scale score was also significantly higher in subgroup 3 than subgroup 2 (17.8 vs. 15.4). The length of education, mean pain intensity, BDI-II score and male/female ratio did not differ between the subgroups.

#### *4.3.5.2 Exploratory factor analysis, principles for factoring and variable (EMS) inclusion and exclusion criteria*

In Study V, the EFA was conducted as described in Subsection 4.3.4.1. However, the number of controls (N=331 controls in Study IV vs. N=271 painful controls in Study V) differed as did the subject to variable ratio, which was 15:1 in both groups.

#### *4.3.5.3 Model specification, identification, modification and mediation analyses*

The models are overidentified and the degrees of freedom (df) vary from 1 to 6. *Post hoc*, the models in both groups were further modified for a possible more parsimonious resolution (Thompson 2004, pp. 70-1) and when attained, the model with the least Minimum Akaike Information Criterion (MAIC, Akaike 1987) was chosen. Minor modifications of the hypothesized models were allowed as long as the direction of paths was not changed, and they were acceptable from a theoretical point of view. As a final step, when the final path model is selected, Kline (2005, pp.153-156) suggests an equivalent model consideration. A different configuration of paths among the same observed variables should therefore be tested to rule out any other possible model. The verbs ‘cause’ and ‘predict’ and the word ‘causality’ in this context must be understood mainly as statistical terms and should be used with caution (Kline 2005, pp. 93-5).

#### ***4.3.5.3.1 Model #1***

This model is adopted from the narratives of chronic pain patients. The basic structure of this model is similar to the study by Arnstein (2000), where pain intensity predicts pain disability and depressiveness, which in turn also predicts pain disability. Arnstein's model also included Self-Efficacy beliefs, which were not measured in this study. The schema factors (SF) are included in this model to predict depressiveness.

#### ***4.3.5.3.2 Model #2***

This model is based on experience of working with chronic pain patients. In this model, depressiveness predicts pain intensity and pain disability. Pain intensity also predicts pain disability. The schema factors (SF) are included in this model to predict depressiveness.

#### ***4.3.5.4 Model estimation and statistical analyses***

All the variables used in the path analyses had normal distribution in skewness and kurtosis and when plotted showed visual normality after normal score command (Preliis 2.80). Although the data did not quite reach multinormality in the control group, maximum likelihood (ML) was used as the path analysis estimation method. ML attains optimal asymptotic properties, namely, that the estimates are normally distributed, unbiased and efficient. First, the slight lack of multinormality in the control group data may underestimate standard errors and overestimate the likelihood ratio of chi-square statistics. It does not, however, affect the parameter estimates (Kaplan 2009). Second, the focus was on the different models in the same group, as group comparisons between the pain patient and control groups were not possible because of a different schema factor structure. On the basis of the aforementioned ML estimation method was used. Covariance matrix served as the data matrix in the path analyses.

#### ***4.3.5.5 Fit indices***

Likelihood ratio chi-square test ( $X^2$ ;  $p > 0.05$ ), Root Mean Square Error of Approximation ( $RMSEA \leq 0.05$ ) (Browne and Cudeck 1993), Standardized Root Mean Square Residual ( $SRMR \leq 0.05$ ) (Jöreskog and Sörbom 1988), Comparative Fit Index ( $CFI \geq 0.95$ ) (Bentler 1988), and Normed Fit Index ( $NFI \geq 0.95$ ) (Bentler and Bonnet 1980) were used as indices for goodness of

fit of the model. Minimum Akaike Information Criterion (MAIC, Akaike 1987) was used to compare competing models; the model with the lowest AIC value among the competing models is deemed to fit the data best from a predictive point of view (Kaplan 2009).

#### 4.3.6 Statistical software

The baseline characteristics and the scale reliability estimations were made with SPSS (version 12.0.1. for Windows) (Study I). The polychoric correlation matrix (Study I) and normal scores (Study V) were calculated with Prelis 2.80, the confirmatory factor analyses (Study I) and path analyses (Study V) were conducted with Lisrel 8.80. The remaining data analyses were conducted with SPSS (16.0.1. for Windows) (Studies II - IV).

#### 4.4 Ethical approval

The study protocol was approved by the ethical committee of the Northern Ostrobothnia Hospital District. Written informed consent was obtained from all participants.



## 5. Results

### 5.1. Validation of the YSQ-S2-extended (Study I)

#### 5.1.1 Reliability of the YSQ-S2-extended

The alphas for the individual EMS subscales varied between 0.94 and 0.79 in the pain patient group and between 0.94 and 0.81 in the control group. In all cases these alpha levels were well above 0.70. (Table 4)

#### 5.1.2 Confirmatory factor analysis of the YSQ-S2-extended

The results of the various CFAs (see Subsection 4.3.1.2) are shown in Table 5. The  $X^2/df$ , RMSEA, NFI, GFI and AGFI values indicated good fit and SRMR acceptable fit to models #1, #2 and #4. All the fit indices indicated good fit to the model #3 (in the total sample) which had the 18 EMS –factor structure with 2 parcelled item-indicators and 1 single item indicator for each EMS subscale (Table 5). The fit statistics of the pain and control groups were found in comparison to be close to each other.

Early Maladaptive Schema (EMS)	pain group					control group				
	$\alpha$	Mean	Med	$\Lambda$ range	$R^2$ range	$\alpha$	Mean	Med	$\Lambda$ range	$R^2$ range
Emotional deprivation	0.92	1.97	1.6	0.94-0.78	0.89-0.61	0.91	1.66	1.4	0.94-0.73	0.88-0.53
Abandonment/ Instability	0.91	1.83	1.4	0.94-0.84	0.87-0.71	0.84	1.69	1.4	0.87-0.72	0.76-0.52
Mistrust/ Abuse	0.89	1.67	1.4	0.89-0.78	0.80-0.60	0.83	1.59	1.4	0.94-0.60	0.88-0.36
Social isolation/ Alienation	0.94	1.87	1.4	0.96-0.87	0.91-0.76	0.88	1.60	1.4	0.93-0.70	0.86-0.49
Defectiveness/ Shame	0.94	1.56	1.0	0.96-0.90	0.93-0.81	0.94	1.41	1.0	0.96-0.93	0.93-0.86
Failure	0.94	1.79	1.4	0.97-0.88	0.94-0.78	0.93	1.66	1.4	0.96-0.88	0.92-0.78
Dependence/ Incompetence	0.86	1.58	1.2	0.95-0.83	0.83-0.69	0.85	1.26	1.0	0.90-0.82	0.81-0.67
Vulnerability to harm or illness	0.87	1.77	1.4	0.89-0.78	0.79-0.61	0.86	1.49	1.2	0.93-0.81	0.86-0.66
Enmeshment/ Undeveloped self	0.84	1.34	1.0	0.92-0.80	0.85-0.65	0.85	1.26	1.0	0.93-0.78	0.86-0.61
Subjugation	0.89	1.48	1.2	0.96-0.84	0.93-0.71	0.85	1.41	1.2	0.90-0.73	0.82-0.53
Self-sacrifice	0.83	3.36	3.2	0.87-0.65	0.76-0.42	0.84	3.20	3.2	0.85-0.68	0.73-0.41
Emotional inhibition	0.88	1.89	1.6	0.98-0.74	0.95-0.54	0.91	1.77	1.6	0.90-0.84	0.81-0.71
Unrelenting standards/ Hypercriticalness	0.83	2.84	2.8	0.92-0.67	0.85-0.45	0.85	2.87	2.8	0.92-0.72	0.84-0.51
Entitlement/ Grandiosity	0.81	1.68	1.4	0.95-0.64	0.90-0.41	0.82	1.57	1.4	0.85-0.68	0.78-0.47
Insufficient self-control/ Self-discipline	0.89	1.88	1.6	0.88-0.80	0.77-0.64	0.84	1.72	1.6	0.88-0.69	0.78-0.48
Approval-seeking/ Recognition-seeking	0.79	2.64	2.6	0.97-0.51	0.94-0.26	0.84	2.80	2.8	0.94-0.57	0.88-0.33
Negativity/ Pessimism	0.86	2.34	2.2	0.88-0.67	0.77-0.45	0.89	2.04	1.8	0.90-0.81	0.81-0.66
Punitiveness	0.81	2.28	2.0	0.91-0.65	0.84-0.43	0.81	2.18	2.0	0.97-0.66	0.95-0.44

*Table 4.* Cronbach's alphas ( $\alpha$ ), mean and median (Med) EMS values, individual schema item loading range ( $\Lambda$  range) and squared multiple correlations range ( $R^2$ ) in pain and control groups.

Table 5. Results of the various confirmatory factor analyses described in Subsection 4.3.1.2.

model	group	$\chi^2$	df	$\chi^2/df$	RMSEA	NFI	SRMR	GFI	AGFI
#1	all	3942	2595	1.52	0.033	0.99	0.052	0.99	0.99
#2	all	4361	2595	1.68	0.038	0.98	0.057	0.98	0.98
#3	all	1661	1224	1.34	0.028	0.99	0.037	1.00	0.99
#4 (odd)	pain group	1217	909	1.34	0.040	0.97	0.070	0.98	0.98
#4 (odd)	control group	1255	909	1.38	0.036	0.98	0.067	0.98	0.98
#4 (even)	pain group	1315	909	1.45	0.044	0.98	0.062	0.99	0.99
#4 (even)	control group	1401	909	1.54	0.043	0.97	0.061	0.98	0.98

Notes:  $\chi^2$  Likelihood ratio chi-square test  
df Degrees of freedom  
RMSEA Root Mean Square Error of Approximation  
NFI Normed Fit Index  
SRMR Standardized Root Mean Square Residual  
GFI Goodness of Fit Index  
AGFI Adjusted Goodness of Fit Index

### 5.1.3 Individual item loadings in the YSQ-S2-extended

The individual factor loadings were taken from analysis #4 and varied in the pain group between 0.97 and 0.51 and in the control group between 0.97 and 0.57 (Table 4). The *t*-test values of all individual loadings were significant. The squared multiple correlations ( $R^2$ ) had values over 0.30 on all items except item AS #80 (*"Lots of praise and compliments make me feel like a worthwhile person"*) in the pain patient group (Table 4). The error variances of the items varied accordingly 0.05-0.74 in the pain group and 0.05-0.67 in the control group.

## 5.2. Analysis of EMSs among chronic pain patients (Study II)

### 5.2.1 The existence of meaningful EMSs

From the total of 271 chronic pain patients 158 (of men 56.7%; of women 59.7%) scored one or more EMSs as meaningful (one schema=21.4%, 2-4 schemas=24%, 5-10 schemas=9.6% and 11-16 schemas=3.3%). The meaningful schema distribution in men and women is shown in Figure 2. In men the scores for Unrelenting Standards/ Hypercriticalness (US) and Self-Sacrifice (SS) EMSs and in women SS and US EMSs showed the highest occurrence in that order of magnitude.

The meaningful and non-meaningful schema groups did not differ by sex, age or length of education. However, patients scoring one or more EMSs as meaningful had more intense, longer duration and more disabling pain. The pain sites or the number of pain locations did not differ between these groups.

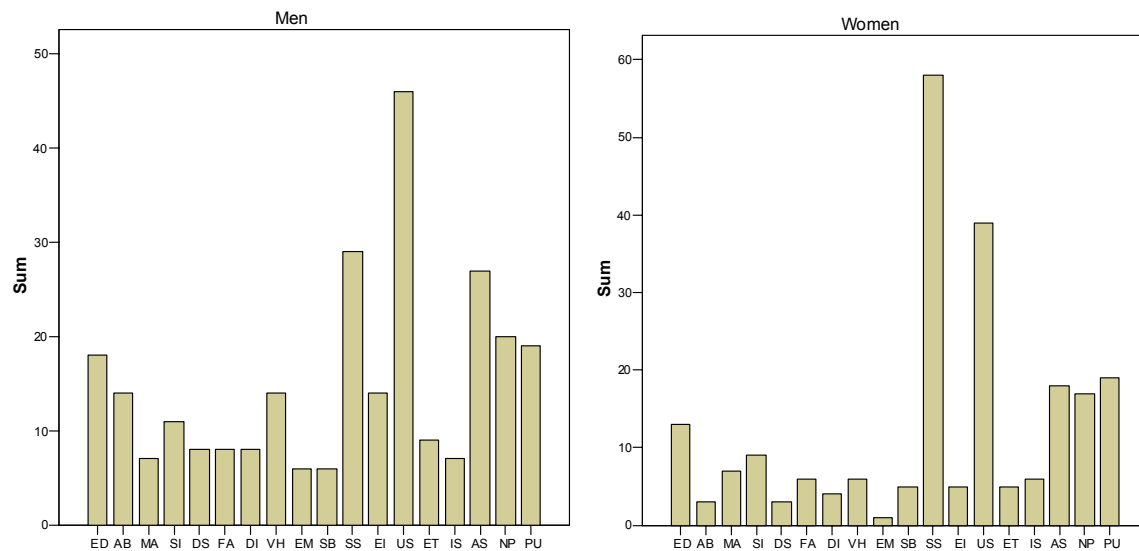


Figure 2. Distribution of meaningful early maladaptive schemas in male and female chronic pain patients.

Notes: Emotional Deprivation = ED. Abandonment/ Instability = AB. Mistrust/ Abuse = MA. Social Isolation/ Alienation = SI. Defectiveness/ Shame = DS. Failure = FA. Dependence/ Incompetence = DI. Vulnerability to Harm or Illness = VH. Enmeshment/ Undeveloped Self = EM. Entitlement/ Grandiosity = ET. Insufficient Self-Control/ Self-Discipline = IS. Subjugation = SB. Self-Sacrifice = SS. Approval-Seeking/ Recognition-Seeking= AS. Emotional Inhibition = EI. Unrelenting Standards/ Hypercriticalness = US. Negativity/ Pessimism = NP. Punitiveness = PU.

## 5.2.2 Manifestation of Self-Sacrifice (SS) and Unrelenting Standards/ Hypercriticalness (US) EMSs in the speech of pain patients

Five male and five female pain patients scoring highest on US or on SS EMSs (totally n=20 cognitive case formulations) were selected for analysis of speech. US EMS can be recognized as perfectionism in work, rigid rules in many areas of life (a lot of "shoulds") and preoccupation with time and efficiency. SS EMS can be recognized as an urge for one to focus voluntarily on fulfilling the needs of others at the expense of one's own gratification (Young et al. 2003).

The most common and obvious feature of patients in both genders scoring high on SS and US EMSs was the importance of work and accomplishments. There was a dilemma in their speech: almost all of them reported that there had been too much work [since childhood] which had caused

them to suffer pain and prevented them from recovering from pain and, at the same time, they hoped to be in less pain to return to the same work [conditions].

The men scoring high on US EMS ignored their pain treatment and preferred to work, they did not accept the use of pain medication and they had difficulties in trusting that others could do things properly. They also had difficulties in accepting help in their daily activities even when in pain. They reported that they did not get enough help from the health care system. All the women scoring high on US EMS were workaholic and described their identity in the terms of working attitudes and skills. While on sick leave, one of them even helped out daily in her office.

The men scoring high on SS EMS had a similar attitude to the men scoring high on US EMS (two of them scored high on US schema, too) “work before health”. They were also concerned about others’ problems and helped other people at their own expense. They even felt responsible for how others were feeling; that is, they had to keep others happy. The women scoring high on SS EMS had difficulties in focusing on questions concerning themselves. They did not express pain [to the people nearby] and did not like to bother others by asking help for themselves although they were exhausted with pain. They hid their pain and were ready to sacrifice for others; one woman scoring high on SS EMS told her spouse that he should leave her because she was such a painful burden.

### 5.2.3 Demographics, EMSs and pain characteristics as predictors of pain and pain disability

In the first regression analyses, age, duration of education, US and SS schemas were entered as independent variables to predict pain intensity. No significant associations were found in either males or females. In the second regression analyses, age, duration of education, pain intensity, duration of pain, number of pain sites, US and SS schemas were entered as independent variables to predict pain disability. Among males, the model predicted pain disability 24.8% by pain intensity and the number of pain sites, and among females, the model predicted pain disability 23.6% by pain intensity, number of pain sites, SS schema and to a lesser degree by age.

*Post hoc*, as SS and US schemas are regarded as conditional and may cover underlying Emotional Deprivation (ED) EMS (Young et al. 2003), a third regression analysis was conducted on the total sample. Age, duration of education, pain intensity, duration of pain, number of pain sites, and ED schema were entered as independent variables to predict pain disability. This model predicted pain disability 24.5%. Pain intensity, number of pain sites and ED schema had equal

significance and almost equal standardized coefficients (.258; .210; .214 respectively). Increasing age also had some predictive value for pain disability (.130).

### 5.3. EMS and Schema Domain differences among chronic pain patients and the control sample (Study III)

#### 5.3.1. Differences between genders and pain patient and control groups in EMS and Schema Domain data and associations with pain variables

In the control group there were no statistically significant gender differences between any variables. In the pain patient group, there were statistically significant differences between men and women in ED, ET, EI and US EMSs, Overvigilance & Inhibition schema domain and pain disability. Men had higher scores on all of these. The Impaired Autonomy & Performance schema domain was significantly higher in pain patients ( $p=0.004$ ). From the individual EMS values Dependence/ Incompetence ( $p<0.001$ ), Vulnerability to Harm or Illness ( $p=0.004$ ) and Negativity/ Pessimism ( $p=0.003$ ) had statistically significantly higher values in the pain patient group and Emotional Deprivation almost reached statistical significance ( $p=0.014$ ). In the pain patient group, there was a medium-sized association between pain disability and SI ( $\rho=.36$ ), DI ( $\rho=.36$ ), ED ( $\rho=.31$ ), SB ( $\rho=.30$ ), NP ( $\rho=.32$ ) EMSs, Disconnection & Rejection ( $\rho=.36$ ) and Impaired Autonomy & Performance ( $\rho=.35$ ) schema domains.

#### 5.3.2 Top and Bottom data of EMSs and Schema Domains

##### Pain patient group

Top (VAS=7.7) and bottom (VAS=4.2) pain intensity groups differed statistically significantly in two schemas, namely Mistrust / Abuse and Dependence/ Incompetence EMSs, and in two schema domains, namely Disconnection & Rejection and Impaired Autonomy & Performance, all of which had statistically significantly higher values in the top group. Top and bottom groups of number of pain locations (4.0 vs. 1.0) and duration of pain (24.0 vs. 1.2 years) did not differ in any EMS or schema domain values. Top and bottom groups in pain disability scale score (PDS=23 vs. PDS=9) differed in Disconnection & Rejection, Impaired Autonomy & Performance and Overvigilance &

Inhibition schema domains, which had statistically significantly higher values in the top group. The values for Abandonment/ Instability, Mistrust/ Abuse, Emotional Deprivation, Defectiveness/ Shame, Social Isolation/ Alienation (SI), Dependence/ Incompetence (DI), Vulnerability to Harm or Illness, Subjugation (SB), Negativity/ Pessimism (NP), Emotional Inhibition and Punitiveness EMSs were statistically significantly higher in the top group of pain disability.

#### Control group

Top (VAS=5.6) and bottom (VAS=0.1) pain intensity, number of pain locations (3 vs. 0), duration of pain in years (6 vs. 0) and pain disability scale score (PDS=12 vs. PDS=0, respectively) groups did not differ significantly in any EMSs or schema domains.

## 5.4. Second order schema factor and regression analyses among chronic pain patients and the control sample (Study IV)

### 5.4.1 Exploratory factor analysis of the EMS data in pain patients and control group

In both groups, the structure matrix suggested a similar factor structure as the pattern matrix, although with lower pattern matrix coefficients the structure matrix coefficients also showed a fairly strong correlation with the other schema factor(s) (Table 6). The schema factor structure was not identical in the two groups.

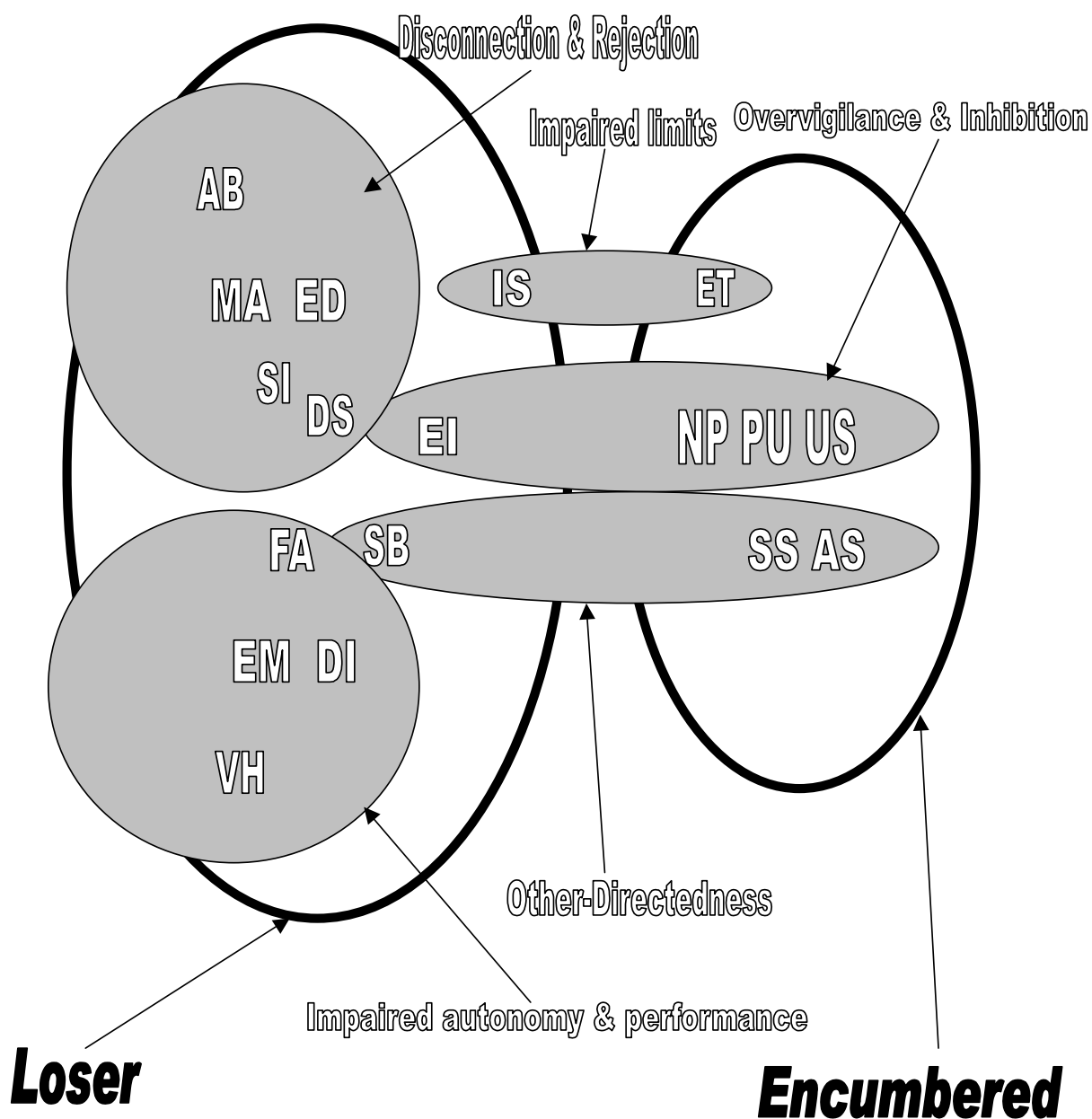
The factor structure in the pain patient group comprised two schema factors (SF) and the total variance explained was 58.9%. The correlation between these 2 SFs was .71. SF1 comprised all EMSs belonging to the Disconnection & Rejection schema domain (ED, AB, MA, SI, DS) and also all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH). From the Other-Directedness schema domain there was SB schema, from the Overvigilance & Inhibition schema domain EI schema and from the Impaired Limits schema domain IS schema. SF2 consisted of all the remaining EMSs, namely SS, AS (Other-Directedness schema domain), US, PU, NP (Overvigilance & Inhibition schema domain) and ET (Impaired Limits schema domain). All the

**Table 6.** Principal axis factoring (promax rotation) of the early maladaptive schemas in pain patient and control groups with 2 and 3 higher order schema factors respectively.

	Pain patient group					Control group						
	Schema Factors					Schema Factors						
	1		2			1		2		3		
early maladaptive schema	p	s	p	s	h <sup>2</sup>	p	s	p	s	p	s	h <sup>2</sup>
emotional deprivation	.797	.746	-.072	.498	.559	.107	.542	-.120	.294	.754	.768	.601
abandonment/instability	.441	.671	.322	.637	.501	.395	.610	.150	.461	.200	.533	.417
mistrust/abuse	.605	.729	.174	.606	.546	.170	.608	.300	.587	.410	.665	.552
social isolation/alienation	.867	.849	-.025	.594	.722	.065	.599	.044	.441	.766	.830	.694
defectiveness/shame	.938	.865	-.102	.568	.753	.620	.774	-.149	.359	.355	.697	.674
failure	.895	.773	-.170	.469	.612	.874	.779	-.144	.325	-.024	.490	.622
dependence/incompetence	.802	.760	-.059	.514	.580	.778	.783	-.066	.391	.063	.549	.617
vulnerability to harm or illness	.456	.668	.297	.623	.489	.603	.678	.154	.479	-.015	.459	.476
enmeshment/undeveloped self	.527	.571	.062	.438	.328	.482	.603	-.079	.303	.246	.530	.397
subjugation	.897	.825	-.101	.540	.685	.567	.755	-.097	.386	.362	.694	.642
self-sacrifice	-.136	.266	.564	.466	.227	-.134	.146	.517	.440	-.005	.149	.207
emotional inhibition	.618	.691	.102	.544	.483	.087	.507	.171	.450	.489	.628	.428
unrelenting standards/hypercriticalness	-.197	.345	.759	.618	.401	-.351	.267	.815	.742	.254	.405	.614
entitlement/grandiosity	.287	.624	.473	.677	.499	.064	.435	.472	.586	.167	.432	.377
insufficient self-control/self-discipline	.447	.661	.300	.619	.481	.434	.602	.280	.529	.021	.442	.418
approval-seeking/recognition-seeking	-.025	.474	.698	.681	.463	.276	.441	.667	.676	-.303	.195	.513
negativity/pessimism	.391	.735	.482	.761	.655	.505	.688	.375	.636	-.035	.478	.570
punitiveness	.212	.683	.659	.810	.678	.179	.498	.641	.716	-.050	.372	.529
Eigenvalue	9.13		1.48			7.36		1.85		1.08		
	Kaiser-Meyer-Olkin 0.943					Kaiser-Meyer-Olkin 0.921						
	Bartlett's test of sphericity <0.001					Bartlett's test of sphericity <0.001						
	Rotation converged in 3 iterations.					Rotation converged in 7 iterations.						

Notes: p=pattern coefficient, s=structure coefficient, h<sup>2</sup>=communalities





**Figure 3:** Loser and Encumbered: the two SFs among the pain patient group and the overlap with the five schema domains described by Young et al. (2003). Notes: Emotional Deprivation = ED. Abandonment/ Instability = AB. Mistrust/ Abuse = MA. Social Isolation/ Alienation = SI. Defectiveness/ Shame = DS. Failure = FA. Dependence/ Incompetence = DI. Vulnerability to Harm or Illness = VH. Enmeshment/ Undeveloped Self = EM. Entitlement/ Grandiosity = ET. Insufficient Self-Control/ Self-Discipline = IS. Subjugation = SB. Self-Sacrifice = SS. Approval-Seeking/ Recognition-Seeking = AS. Emotional Inhibition = EI. Unrelenting Standards/ Hypercriticalness = US. Negativity/ Pessimism = NP. Punitiveness = PU.

items of the EMSs with the highest pattern coefficients were read and labelled as follows: SF1 = *Loser* (shameful and defective, socially isolated, failure, emotionally inhibited and deprived, submissive and resigned) and SF2 = *Encumbered* (high standards, punitive if standards were not met, approval seeking and self-sacrificing) (Figure 3).

In the control group, the results comprised 3 SFs and the total variance explained was 60.5%. The correlation between these 3 SFs was SF1-SF2  $r=.54$ ; SF1-SF3  $r=.66$  and SF2-SF3  $r=.47$ . SF1 consisted of all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH), and DS (Disconnection and Rejection schema domain), NP (Overvigilance and Inhibition schema domain), SB (Other Directedness) and IS schemas (Impaired Limits schema domain). SF2 consisted of PU, US (Overvigilance & Inhibition schema domain), SS, AS (Other Directedness) and ET schemas (Impaired Limits). SF3 comprised SI, ED, MA (Disconnection and Rejection schema domain) and EI schemas (Overvigilance & Inhibition schema domain). Abandonment EMS (Disconnection and Rejection schema domain) fell between SF 1 and SF 3 and was excluded from the analyses. All the items of the EMSs with the highest pattern coefficients were read and labelled as follows: SF1 = *Endangered* (failure, dependent, pessimistic, defective and vulnerable), SF2 = *Encumbered* (high standards, punitive if standards not met, approval seeking and self-sacrificing) and SF3 = *Lonely* (socially isolated, emotionally deprived, mistrusting and emotionally inhibited). The five hypothesized schema domains could not be identified in either group.

#### 5.4.2 Predictive effect of the schema factors on pain intensity and depression

In the first regression analysis pain intensity was used and in the second analysis the BDI-II was used as the dependent variable and SF1-2 (chronic pain patients) or SF1-3 (control participants) as the independent, predictive variables. *A priori*, as the BDI-II was plotted against SF1score (chronic pain patients) the relationship was not absolutely linear, so a logarithmic correction was made [ $=\log_{10}(\text{SF1score} + 2)$ ]. After that, their relationship was also linear. The results of the regression analyses with pain intensity as the dependent variable did not show any statistically significant predictive value of SF1-2 (chronic pain patients) or SF1-3 (control participants) for pain. In the pain patient group, SF1 predicted BDI-II ( $\beta .648$ ,  $t=9.41$ ,  $p<.001$ ). The variation of the model explained the variation of BDI-II 55% (CI95 46%-64%). In the control group the standardized regression coefficient was highest for SF1 ( $\beta=.294$ ,  $t=3.89$ ,  $p<.001$ ), then for SF3 ( $\beta=.265$ ,  $t=3.67$ ,  $p=.001$ ). In the control group, the variation of the model explained the variation of BDI-II 31% (CI95 25%-37%). After the regression analyses, the saved residuals were plotted against saved predicted variables and independent variables to confirm linear relationship and homoscedasticity. The normality of the residuals was also checked. No victimization of the aforementioned was detected.

## 5.5. Analyses of different biopsychosocial pain models among a pain patient and a painful control sample (Study V)

### 5.5.1 Exploratory factor analysis of the EMS data among pain patients and a painful control sample

In both groups, the structure matrix suggested a factor structure similar to that of the pattern matrix, although with lower pattern matrix coefficients the structure matrix coefficients showed a fairly strong correlation with the other schema factor(s). The schema factor structure was not identical in the two groups.

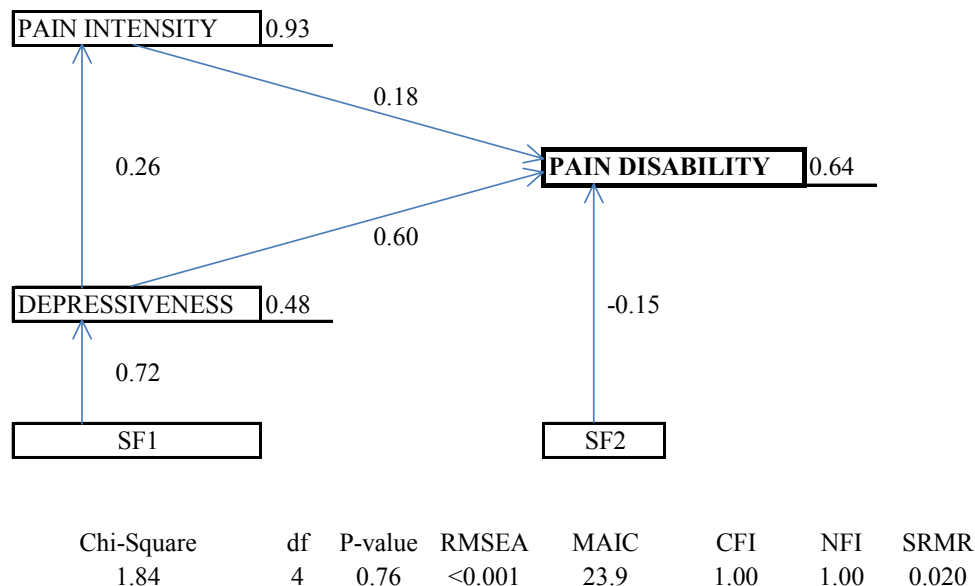
The factor structure in the pain patient group consisted of two schema factors (SF) and the total variance explained was 58.9%. The correlation between these 2 SFs was 0.80. The SF1 comprised all EMSs belonging to the Disconnection & Rejection schema domain (ED, AB, MA, SI, DS) and all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH). From the Other-Directedness schema domain there was SB EMS, from the Overvigilance & Inhibition schema domain EI EMS and from the Impaired Limits schema domain IS EMS. The SF2 consisted of all the remaining EMSs, namely SS, AS (Other-Directedness schema domain), US, PU, NP (Overvigilance & Inhibition schema domain) and ET (Impaired Limits schema domain).

Among the painful controls, the results comprised 3 SFs and the total variance explained was 59.4%. The correlation between these 3 SFs was; SF1-SF2 0.68; SF1-SF3 0.72 and SF2-SF3 0.58. The SF1 consisted of all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH), SB (Other-Directedness) and NP (Overvigilance & Inhibition schema domain). The SF2 consisted of US, PU (Overvigilance & Inhibition), AS, SS (Other-Directedness) and ET EMSs (Impaired Limits). The SF3 comprised SI, ED, MA (Disconnection & Rejection) and EI EMSs (Overvigilance & Inhibition schema domain). AB, DS and IS EMSs did not load on any SF or loaded on two different SFs, thus they were excluded from the analyses.

### 5.5.2 Testing and modification of different biopsychosocial pain models

#### *5.5.2.1 Pain patients and the control group*

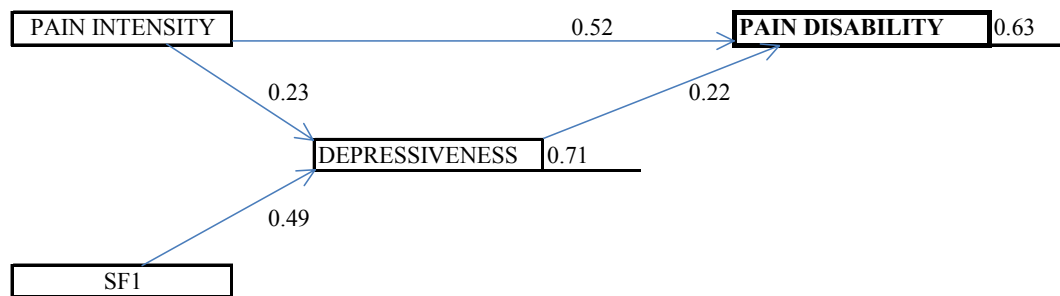
The data obtained in the pain patient group supported model #2 (see Subsections 4.3.5.3.1-2). In that model, SFs predicted depressiveness and depressiveness predicted pain intensity and pain disability. Also, pain intensity predicted pain disability. *Post hoc*, to achieve the most parsimonious model with the best fit, the *t*-values of the paths were estimated. As a model modification procedure, the insignificant paths were deleted (one by one). In the pain patient group, the path from SF2 to BDI-II was removed first. The model was reanalysed. According to the output statistics, a path was made from SF2 to pain disability and the model was reanalysed. The final model (Figure 4) showed excellent fit indices, namely  $\chi^2$ ;  $p=0.76$ , RMSEA < 0.001, MAIC=23.9, CFI=1.00, NFI=1.00 and SRMR=0.020. In the pain patient model, an equivalent model was checked (Kline 2005). SF2 and VAS predicted PDS, and SF1, VAS and PDS predicted BDI-II, which was the ‘end state’. The model was not approved ( $\chi^2=18.7(2)$ ,  $p<0.001$ , RMSEA=0.178).



**Figure 4.** The final and the most parsimonious model in the pain patient group. The standardized regression coefficients and error variances are shown. Notes: SF=schema factors 1-2, df=degree of freedom, P-value=Chi-Square significance, RMSEA=Root Mean Square Error of Approximation, MAIC = Model Akaike Information Criterion, CFI = Comparative Fit Index, NFI = Normed Fit Index, SRMR = Standardized Root Mean Square Residual

The data obtained in the control group supported model #1. In that model, schema factors and pain intensity predicted depressiveness. Both depressiveness and pain intensity predicted pain disability. As a post hoc ‘*parsimonisation*’ in the control group, the path from SF2 to BDI-II was first deleted and the path analysis was reanalysed. The path from SF3 to BDI-II was also deleted. The final model (Figure 5) showed excellent fit indices, namely  $\chi^2$ ;  $p=0.92$ , RMSEA < 0.001, MAIC=18.0, CFI=1.00, NFI=1.00 and SRMR=0.0013. In the control group, an equivalent model

where VAS predicted PDS, and SF1, VAS and PDS predicted BDI-II ('end state'), was not approved ( $\chi^2=4.15(1)$ ,  $p=0.042$ , RMSEA=0.11).

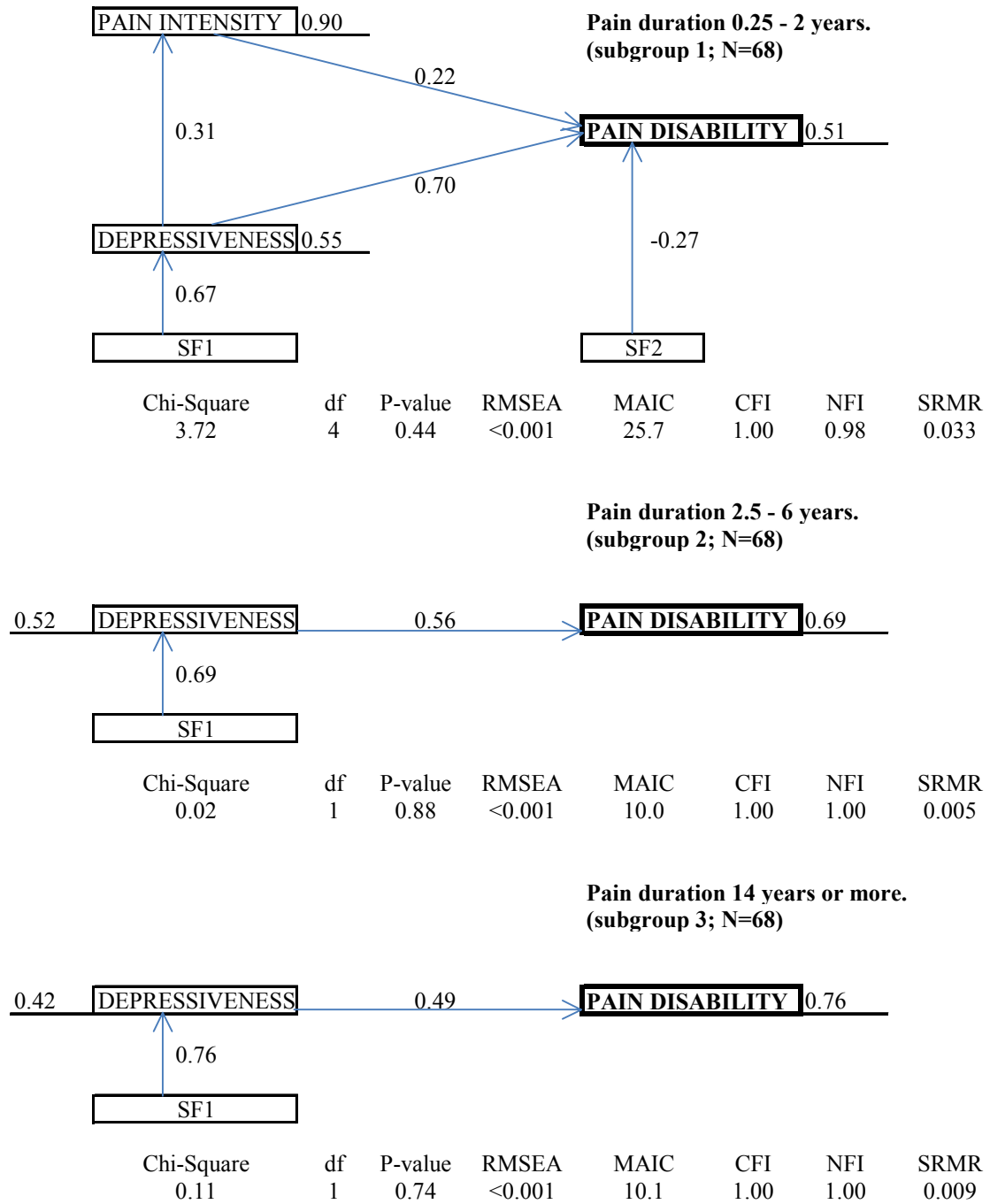


Chi-Square	df	P-value	RMSEA	MAIC	CFI	NFI	SRMR
0.01	1	0.921	<0.001	18.0	1.00	1.00	0.0013

**Figure 5.** The final and the most parsimonious model in the control group. The standardized regression coefficients and error variances are shown. Notes: SF=schema factors 1-3, df=degree of freedom, P-value=Chi-Square significance, RMSEA=Root Mean Square Error of Approximation, MAIC = Model Akaike Information Criterion, CFI = Comparative Fit Index, NFI = Normed Fit Index, SRMR = Standardized Root Mean Square Residual

#### 5.5.2.2 Pain patient subgroups with differing duration of pain

The pain patient model #2 (Figure 4) was reanalysed with three subgroups of pain duration (see Subsection 4.3.5.1) and accordingly, the models were '*parsimonised*' if needed. The effect size of SF1 on depressiveness was 45 %, 48% and 58% in subgroups 1, 2 and 3 respectively. There was no effect of SF2 on pain disability in subgroups 2 and 3. In subgroup 1, the effect size of depressiveness on pain intensity was 9.6%. In subgroups 2 and 3, there was no longer a significant effect size from depressiveness to pain intensity. In subgroups 2 and 3, pain intensity did not predict pain disability. The effect size of depressiveness on pain disability was 49 %, 31% and 24% in subgroups 1, 2 and 3 respectively. As pain duration increased the error variance of pain disability increased. All the fit indices were excellent in subgroups 1, 2 and 3 of pain duration. (Figure 6).



**Figure 6.** The pain models of three subgroups of pain duration in the pain patient sample. Notes: SF=schema factors 1-2, df=degree of freedom, P-value=Chi-Square significance, RMSEA=Root Mean Square Error of Approximation, MAIC = Model Akaike Information Criterion, CFI = Comparative Fit Index, NFI = Normed Fit Index, SRMR = Standardized Root Mean Square Residual

### 5.5.3 Parameter estimates

#### 5.5.3.1 Pain patient group

As the variables observed had different scales, the standardized regression coefficients are shown (Figure 4). The effect size (squared multiple correlation= $R^2$ ) of the BDI-II was approximately 11 times the effect size of VAS on pain disability. SF1 accounted for 52% of the variance of the BDI-II. Ninety three percent of the variance of VAS were unexplained. Two thirds (64%) of pain disability remained unexplained.

#### 5.5.3.2 Control group

The standardized regression coefficients are shown in Figure 5. The effect size of SF1 was approximately 4.5 times the effect size of VAS on the BDI-II. The effect size of VAS was 5.6 times the effect size of the BDI-II on pain disability. SF1 and VAS accounted for 29% of the variance of the BDI-II. Pain intensity and the BDI-II accounted for 37% of the variance of pain disability.

### 5.5.4 Testing of the mediation effect of pain intensity and depression

#### 5.5.4.1. Pain patient group

The pain patient model (Figure 4) was subjected to a mediator analysis to ascertain 1) if depression (BDI-II) was a mediator between SF1 and pain disability and 2) if pain intensity (VAS) was a mediator between depression and pain disability. When SF1 was used as a predictor of pain disability, the path coefficient was significant ( $\gamma=0.36$ ,  $t=6.23$ ). When depression was entered into the model as a mediator the aforementioned path became non-significant ( $\gamma=-0.10$ ,  $t=-1.39$ ). The path from SF1 to depression was significant ( $\gamma=0.72$ ,  $t=17.1$ ) and the path from depression to disability was also significant ( $\beta=0.63$ ,  $t=8.66$ ). Depression can be seen as a full mediator between SF1 and pain disability. When depression was used as a predictor of pain disability the path coefficient was significant ( $\gamma=0.56$ ,  $t=11.1$ ). When pain intensity was entered into the model to measure its mediator effect, the value of the path from depression to pain disability diminished slightly ( $\gamma=0.51$ ,  $t=9.98$ ). The values of the path from depression to pain

intensity ( $\gamma=0.26$ ,  $t=4.46$ ) and from pain intensity to pain disability ( $\beta=0.18$ ,  $t=3.45$ ) were significant. Pain intensity had a mediator effect.

#### *5.5.4.2. Control group*

The model of the control group (Figure 5) was subjected to a mediator analysis. When SF1 was used as a predictor of pain disability, the path coefficient was non-significant ( $\gamma=0.10$ ,  $t=1.68$ ). When pain intensity was used as a predictor of pain disability, the path coefficient was significant ( $\gamma=0.57$ ,  $t=11.29$ ). To measure the mediator effect of depression, the value of the path between pain intensity and disability diminished to a value of 0.52 when the BDI-II was entered into the model and there was a significant path coefficient from pain intensity to depression ( $\gamma=0.23$ ,  $t=3.93$ ) and from depression to pain disability ( $\beta=0.22$ ,  $t=4.38$ ). Depression had a mediator effect.



## 6. Discussion

### 6.1 The psychometric properties of the Young Schema Questionnaire-short form-extended

For the first time the latent structure of 18 EMSs was confirmed in the Finnish language version of the YSQ-S2-extended (the original YSQ-S2 and AS, NP and PU EMSs). The appropriateness of the scale with chronic pain patients was shown. The individual schema loadings and squared multiple correlations proved to be sufficient. The YSQ was validated with the oldest sample so far and the control group was from among normal life circumstances. Also for the first time, the individual item loadings of YSQ could be measured. The results showed that the latent factor structure proposed by Young et al. (2003) could also be revealed with the Finnish version of the scale and in patients with somatic symptoms. The structural model of the YSQ with 18 contemporary schemas (Young et al. 2003) was confirmed. The statistical problems arising with the confirmation of the YSQ-S2-extended are discussed in Section 6.10.1.

### 6.2 Presence of EMSs and schema driven behaviour in chronic pain patients

More than half of the chronic pain patients scored one or more early maladaptive schemas as meaningful, indicating the possibility of early emotional trauma. Male and female chronic pain patients mostly scored Unrelenting Standards/ Hypercriticalness and Self-Sacrifice (SS) schemas. The most scored EMSs and the behaviour induced by them served as an independent trap for the perpetuation of chronic pain.

In the chronic pain patient population, Self-Sacrifice (SS) schema was the highest scored schema in women and the second highest scored schema in men. In the analyses of speech, the pain patients with meaningful SS schema gave their time, support, help and empathy to others and neglected their

own needs and finally became *pain-exhausted*, because only the maximum pain was able to stop them. They often assumed a caregiver's role and hid their pain. According to Young et al. (2003) the patient with SS schema almost always has an accompanying Emotional Deprivation schema (ED), which she/he seldom recognizes. The patient focuses on the needs of others, which works for the ED schema maintaining coping style – her/his own needs will go unrecognized and unmet.

Unrelenting Standards/ Hypercriticalness (US) schema was the highest scored schema in male and the second highest scored EMS in female pain patients. The analysis of speech showed that US schema precipitated the pain problem, as the pain patients were very conscientious in their work and did not listen to their bodies. The patients were workaholics and ignored their bodily sensations or need for rehabilitation. They also often tried to use as few painkillers of every kind as possible. One may ask if US schema explains disappointment with earlier care and the vast number of ineffective treatments in their stories. It is possible that the demands of patients scoring high on US schema cast the pain treating personnel in the role of trying all possible tricks. US schema is also regarded as a compensatory schema for ED and Defectiveness/Shame schemas (Young et al. 2003).

From a different frame of reference, Barsky (1989) was the first investigator to use the term 'counterdependent' to summarize the personality characteristics of patients with chronic pain. Counterdependence was characterised by emotional suppression, the idealization of relationships, strong work ethics, caregiver role-identity and self-reliance. Counterdependency was found as a trait typical of a chronic pain patient subgroup and it was independent of alexithymia, anxiety, depression and somatic amplification (Gregory and Berry 1999). Interestingly, strong work ethics according to the US and AS schemas (=Approval-Seeking/Recognition-Seeking, the 3<sup>rd</sup> highest occurring schema in male pain patients), and caregiver role identity with SS schema are similar to counterdependency suggesting the existence of personal traits similar to those seen in this study. Van Houdenhove et al. (2001b) used the term 'action-proneness' for an overactive lifestyle found in patients with chronic fatigue syndrome (CFS) and fibromyalgia (FM). More specifically, the patients had a tendency to exceed their physical limits, strive frenetically for achievement, approval or perfection. They supposed action-proneness to be a predisposing, initiating and perpetuating factor for CFS and FM. The aforementioned is highly congruent with the US and SS schema driven behaviour seen in this study. Finestone et al. (2008) suggested that from among the biopsychosocial factors, stress may have a deleterious effect on tissue healing, which may serve as a precipitating factor for chronic musculoskeletal pain. Thus, pain patients are in danger of exacerbating their pain disease when high in standards and self-sacrifice.

A personal trait of approval-seeking, self-sacrifice and unrelenting standards is also described in patient cases of emotional deprivation disorder (Baars and Terruwe 2002). Young et al. (2003, p.

215) state *‘This [Emotional Deprivation] is probably the most common schema we treat in our work, although patients frequently do not recognize that they have it’* Are pain patients scoring high on US and SS schemas also suffering from emotional deprivation, namely, deprivation of nurture, empathy and/or protection. As Imbierowicz and Egle (2003) also found that pain patients with fibromyalgia and somatoform pain disorders reported lack of physical affection, a poor emotional relationship with both parents, and separation, perhaps emotional deprivation has a role in the development of chronic pain. Emotional abuse [with other adversities] was found to be related to female breast pain (Colegrave et al. 2001), to an increased number of different pain conditions in individual migraine patients (Tietjen et al. 2010), to an increased prevalence of pelvic pain in men (Hu et al. 2007) and to the number of pain disorders in adulthood (Sansone et al. 2006). Women with chronic pelvic pain suffered more emotional neglect in their childhood than women in the pain-free control group (Lampe et al. 2000). The mediating role of emotional trauma in the development of chronic pain was hypothesized by Rome and Rome (2000) and the neurobiological basis was explained by corticolimbic sensitization. Latterly, the functions of the insula (e.g. attention to unpleasantness, Kulkarni et al. 2005, Starr et al. 2009) and ACC (e.g. social exclusion, uncontrollability and facilitation of pain, Eisenberger et al. 2003, Salomons et al. 2004) and the inability of VLPFC to produce positive reappraisals for personal pain management (Wiech et al. 2008) may be further explanatory clues of different regions of the CNS to produce pain among people suffering emotional deprivation and abuse in childhood.

### 6.3 Relationship between EMSs and pain variables among chronic pain patients

According to the data, Emotional Deprivation schema was associated with pain disability as much as pain intensity and number of pain sites. In female patients, pain disability was also associated to a significant degree with SS schema. All 18 EMSs were present as meaningful in the pain patient sample. Those scoring EMSs as meaningful had more intense pain, longer duration of pain and more pain disability. This suggests that early emotional adversities may even predispose to more intense pain disease, which concurs with the studies by Van Houdenhove et al. (2001a) and Walker et al. (1997).

According to the regression analyses, pain intensity was not predicted by any of the measures used. Among women Self-Sacrifice schema predicted pain disability more than increasing age but to a lesser degree than mean pain intensity or number of pain sites. In the total sample, Emotional

Deprivation (ED) schema predicted pain disability to the same extent as pain intensity and the number of pain sites and more than increasing age. When the ED schema valence increased the chronic pain patient suffered more inability to live and cope with pain. Also, as Young et al. (2003) stated, *'patients may have many physical complaints - psychosomatic symptoms – with the secondary gain of getting people to pay attention to them and take care of them (although this function is almost always outside their awareness)'*.

## 6.4 Comparison of data on EMS and schema domain among chronic pain patients and a control sample

The Impaired Autonomy & Performance schema domain was higher among the chronic pain patient group, which also showed an increase in EMSs reflecting inability to perform and manage alone, pessimism and catastrophic beliefs. The main finding was that pain disability showed most variation in schema domain and EMS activity, but only in the pain patient group. Chronic pain patients with severe pain disability had an increase in Disconnection & Rejection schema domain reflecting early psychological maltreatment, such as emotional abuse, neglect and abandonment. They also had an increase in Overvigilance & Inhibition schema domain reflecting rigidity and suppression of spontaneous feelings. Chronic pain patients with severe pain intensity or pain disability showed an increase in Impaired Autonomy & Performance schema domain.

The pain patient group showed a rise in Dependence/Incompetence EMS and in the Impaired Autonomy & Performance schema domain. Patients may feel inadequate, unable to cope with their everyday responsibilities and experience helplessness. Insecure attachment complicates the normal separation from the parents and maturation (Davila and Bradbury 2001, Dallaire and Weinraub 2005, Troisi et al. 2005). Dependence/ Incompetence EMS is described as childlike and helpless and as unable to take care of oneself and to cope (Young et al. 2003). With such a schema driven behaviour pain patients may even be vulnerable to harmful treatment decisions made by others. Lack of self-efficacy is associated with pain and disability (Estlander et al. 1994, Meredith et al. 2006), and resembles the pattern of Dependence/ Incompetence EMS. Behaviour driven by Dependence/ Incompetence EMS may also be a call for emotional care and support.

Vulnerability to Harm or Illness EMS is the exaggerated fear that catastrophe will strike at any moment. Fear focuses on medical, emotional or external (e.g. accident, crime) catastrophes and may arouse anxiety and avoidance (Young et al. 2003). The belief that something terrible is about to

happen may lead the chronic pain patient to request repeated new examinations (X-ray, nuclear magnetic resonance) and treatments (drugs, operations) which may relieve anxiety but also cause iatrogenic traumatization and increase the treatment costs. Furthermore, the repeated operations usually increase the physically felt pain. Vulnerability to Harm or Illness EMS may cause restrictions in life and resembles the fear avoidance model, which explains that back pain related fear is especially associated with impaired physical performance and increased pain disability (Vlaeyen et al. 1995, Al-Obaidi et al. 2000, Vlaeyen and Linton 2000, Turk et al. 2004, Carleton and Asmundson 2009).

Patients with Negativity/Pessimism EMS may display a pervasive, lifelong focus on the negative aspects of life, such as pain, death, loss, failure; the childhood history is hardship and loss. There may also be an underlying Emotional Deprivation EMS (Young et al. 2003). Negativity/Pessimism may be a most problematic EMS, as it can lead to depression and to pessimism e.g. towards rehabilitation and the general outcome. Total negativity can also affect the pain treating personnel.

Banks and Kerns (1996) delineated three models of pain-depression relationship, one of which was a helplessness model. Helplessness, or low self-control, was shown to be associated mainly with depressiveness (measured with the BDI) among chronic LBP patients in the study by Maxwell et al. (1998). Helplessness mostly resembles the Impaired Autonomy & Performance schema domain, and may even serve as a mediator between pain and depression. DI, VH and NP EMSs, the Impaired Autonomy & Performance schema domain and the '*Loser's pattern*' may predispose a person to pain as follows: 1) EMS items of DI, VH and NP contain the foundations of beliefs which are typical for the rules of the pain modulation mechanisms of the insula and ACC; 2) NP and VH EMSs may increase attention to pain; 3) *Loser's* role and Impaired Autonomy & Performance schema domain activity may hinder VLPFC from forming successful reappraisals. If a person feels fear, anxiety, helplessness, inability to control pain or has a lot of painful memories (Kelly et al. 2007), he/she may be unable to retrieve '*good endings*' and thus form cognitive reappraisals (e.g. Sawamoto et al. 2000; Salomons et al. 2004; Kulkarni et al. 2005; Wiech et al. 2008; Starr et al. 2009) to activate the inhibitory descending system of pain (DLPFC – insula - posterior ACC - PAG -axis). As Apkarian et al. (2004) found, the DLPFC showed decreased grey matter density among chronic back pain patients, which is likely to be related either to reduced formation or exhaustion of the pain inhibitory system.

## 6.5 EMS and schema domain associations with different pain variables in pain patient and control groups

Dichotomizing the data to the Top-Bottom pairs showed that the widest variation in EMS scores was among the most and least disabled pain patients, but only in the pain patient group. All the EMSs belonging to Disconnection & Rejection schema domain (ED, AB, MA, DS, SI) were higher in the most disabled individuals. Young et al. (2003, p. 13) state that *'patients with schemas in this schema domain (especially the first four EMSs, namely AB, MA, ED, DS) are often most damaged. Many had traumatic childhoods'*. AB and SI EMS items contain statements of being abandoned and socially isolated. The items of ED and MA EMSs focus on psychological neglect, deprivation and betrayal and the items of DS reflect core beliefs of shame and defectiveness. In the study by Cecero et al. (2004) MA, ED and DS EMSs were predicted by childhood emotional abuse, and ED and DS EMSs were predicted by childhood emotional neglect. When pooled, schema theory and the aforementioned data [which mostly contained emotional items] suggest that the most disabled chronic pain patients suffered from early, mainly emotional maltreatment.

The Top-Bottom pairs of disability showed the same differences in Impaired Autonomy & Performance schema domain as previously mentioned in the general differences between the pain patient and the control groups. However, Subjugation EMS was also rated higher in the *Top* group. The problem of SB EMS is that it may allow pain to control and limit life with disability. People with Subjugation EMS do not fight back; they surrender (Young et al. 2003). The *Top* group also had higher values in Overvigilance & Inhibition schema domain, which according to Young et al. (2003, p. 20), reflects suppression of spontaneous feelings and rigidity, internalized rules on own performance at the expense of happiness, self-expression, close relationships, relaxation and good health. Unfortunately, in clinical practice (according to the experiences of A.S. and T.S.) this is the case with many chronic pain patients. They think that with their pain they have lost all the good things in their lives. Of the individual EMSs, NP, Emotional Inhibition and Punitiveness were rated higher [in the *Top* group]. People with EI EMS are excessively inhibited about discussing and expressing their emotions, good or bad (Young et al. 2003). As assertiveness can be seen as 'good' anger (Greenberg and Paivio 1997), pain patients with EI may be prone to pain behaviour as the only way to set limits. People with PU EMS think that people - including themselves - should be harshly punished for their mistakes (Young et al. 2003). This serves as a cruel trap for the pain patient - if they obey the PU EMS, they become more and more exhausted and have more pain, and if they fail, they feel shame and guilt and think they should be punished. According to the schema theory, these results suggest that becoming disabled by chronic pain is a consequence of the earliest

EMSs belonging to the Disconnection & Rejection schema domain but also to Impaired Autonomy & Performance and Overvigilance & Inhibition schema domains. It has been shown that there may be a disconnection between the perceived disability and the objectively measured functional deficit in chronic low back pain (Carleton et al. 2010). It is possible that some of the aforementioned EMSs e.g. SB, DI, FA and NP may have an effect on this subjective observation.

When dichotomizing the pain intensity data, the *Top* group showed an increase in Mistrust/ Abuse and Dependence/ Incompetence EMSs, but only among the pain patient sample. The increase in MA EMS may indicate that intense pain is facilitated by early psychological mistrust and abuse (ACC). The increase in DI EMS was discussed previously. The *Top* group of pain intensity also showed a higher value of Disconnection & Rejection schema domain, which supports the idea that high pain intensity is affected by early psychological trauma. The effects of the higher value of Impaired Autonomy & Performance schema domain were also discussed earlier. The number of pain locations or the duration of pain did not reveal any differences in EMSs or schema domains between the *Top* and *Bottom* groups.

In the *Top* and *Bottom* groups of the control sample, no EMS or schema domain values differed significantly on any pain variable. The absence of any significant EMS differences among the *Top*-*Bottom* pairs in the control group raises questions. Does the absence tell us that their belief system is more intact and thus their descending inhibitory pain modulatory system works better? The dichotomizing of pain disability did not arise any increase in the earliest schema domain, namely Disconnection & Rejection - does this mean that they do not suffer from early emotional maltreatment?

Grzesiak (1994) distinguished chronic pain syndrome patients from among individuals with chronic persistent pain as the ones who do not cope well and succumb to a broad array of biopsychosocial dysfunctions. They bring to the clinical situation vulnerability and lack of resilience. According to this study, the disabled chronic pain patients suffered mostly from early emotional maltreatment, which obviously impaired their abilities to cope. When overcome by pain, they feel that no one is on their side or there to take care of them (Emotional Deprivation), they are afraid of being abandoned (Abandonment/Instability), they do not trust people close to them and are afraid of betrayal (Mistrust/Abuse), feel social isolation (Social Isolation/ Alienation) and that they are defective and worthless (Defectiveness/ Shame). With such a cognitive and emotional arsenal defeat is axiomatic.

Earlier studies have shown an association between physical, sexual and/or emotional maltreatment and fibromyalgia (Walker et al. 1997, Van Houdenhove et al. 2001a, Imbierowicz and Egle 2003, Sansone et al. 2006), chronic pelvic pain (Lampe et al. 2000, Hilden et al. 2004, Thomas

et al. 2006, Hu et al. 2007) and migraine (Sansone et al. 2006). However, the opposite has also been reported (Raphael et al. 2001, Nickel et al. 2002, Ciccone et al. 2005). The most disabled pain patients had their pain distributed all over their bodies, but mainly in the neck and shoulders (61%) and lower back (80%) regions. These results extend the association of early emotional traumatization to chronic spinal pain.

## 6.6 The psychic patterns (latent second order EMS factors) among chronic pain patients and a control sample

The chronic pain patient group showed a parsimonious higher-order schema factor structure. The first factor reflected a *Loser's* role (shameful, defective, socially isolated, failure and emotionally deprived and inhibited patterns), while the second factor reflected an *Encumbered's* role (high standards, punitive, approval seeking, self-sacrificing and pessimistic patterns). The first schema factor (SF) predicted over half (55%) of the depression among chronic pain patients. The control group consisted of three SFs, of which the first and third factors predicted 31% of depression. In neither group did any SF predict pain intensity. The exploratory factor analysis methods used are discussed in Section 6.10.2.

Among the pain patients, the first and larger SF1 consisted of all EMSs belonging to Disconnection & Rejection and Impaired Autonomy & Performance schema domains and of Subjugation, Emotional Inhibition and Insufficient Self-Control/ Self-Discipline (IS) EMSs. The highest loadings belonged to Defectiveness/Shame (DS), Subjugation (SB), Failure (FA), Social Isolation/Alienation (SI), Dependence/Incompetence (DI) and Emotional Deprivation (ED) schemas in that order of magnitude. The contents of the individual items of the highest rated EMSs share a picture of a patient [with pain], who feels defective (disabled by pain) and for that reason shameful and isolated, subjugated (because of the pain and disability) to be dependent on others, and (originating from childhood) without nurture. Accordingly, it was labelled *Loser*.

In chronic pain patients, SF2 comprised Unrelenting Standards/ Hypercriticalness (US), Approval-Seeking/ Recognition-Seeking (AS), Punitiveness (PU), Self-Sacrifice (SS), Negativity/ Pessimism (NP) and Entitlement/ Grandiosity (ET) EMSs in that order of magnitude. The relevance of SS and US EMSs on pain was discussed in Subsection 6.2. SF2 gives a fairly typical clinical picture of a chronic pain patient, who is self-demanding, seeks approval almost resignedly and self-sacrificingly and punitive towards him or herself if unsuccessful. It was labelled *Encumbered*



although even *Slavedriver* would have been a suitable label on SF2. Van Houdenhove et al. (2001b) found that so called *action-proneness* (i.e. overactive lifestyle, pursuit for achievement, approval and perfection) was found among fibromyalgia and chronic fatigue patients. According to Van Houdenhove et al. (2001b) and Finestone et al. (2008) such a lifestyle can be a predisposing, initiating and perpetuating factor for chronic pain and it strongly resembles the content of SF2 (*Encumbered*).

These two factors seem to be reciprocal, i.e. acting and relating on each other. When a person strives frenetically, he or she is approved of and when he or she fails, he or she becomes shameful. According to cognitive analytical therapy (Ryle 1997) the reciprocal roles are proposed to be internalized mostly from the child-parent relationship. Young et al. (2003) suggested that ED EMS may go unrecognized and emerge in conditional schemas (SS, US, AS) and even show up in PU EMS. Thus, SF2 can be the pain predisposing and sustaining factor, which prevents the pain patient from relaxing and setting limits, for example. When the limits are exceeded for years, the pain patient becomes painful and disabled. Then he or she succumbs to the core beliefs of SF1 (*Loser*).

The control participants showed a three-factor pattern of the higher order schema factors. SF1 (labelled *Endangered*) consisted of all the EMSs belonging to the Impaired Autonomy & Performance schema domain, but also of Defectiveness/ Shame (DS), Negativity/ Pessimism (NP), Subjugation (SB) and Insufficient Self-Control/ Self-Discipline (IS) EMSs. SF2 (labelled *Encumbered*) consisted of Unrelenting Standards/ Hypercriticalness (US), Approval-Seeking/ Recognition-Seeking (AS), Punitiveness (PU), Self-Sacrifice (SS) and Entitlement/ Grandiosity (ET) schemas. SF3 (labelled *Lonely*) consisted of Emotional Deprivation (ED), Social Isolation/ Alienation (SI) and Mistrust/ Abuse (MA) EMSs from the Disconnection & Rejection schema domain and from Emotional Inhibition EMS. Abandonment/ Instability EMS did not load adequately on any factors.

## 6.7 Predictive characteristics of the latent schema factors in pain intensity and depressiveness

Why did no schema factor predict pain intensity? There may be some explanations for this. First, due to the long suffering from pain among the chronic pain patients there was no access to the beginning of the pain disease. Likewise in the control group, no such association was found. However, as the latent factor structure between the groups was different, they probably represented two different kinds of groups with different kinds of underlying psychic structure. Maybe pain

intensity and schema factor valences are not parallel processes. One way to ascertain their relationship would be to use longitudinal analysis. Second, pain intensity is a way to convey the suffering to get the best possible relief for the longstanding severe pain on the first visit to the pain clinic. Third, Grzesiak (1994) distinguished chronic pain syndrome patients from individuals with chronic persistent pain as the ones who do not cope well and succumb to a broad array of biopsychosocial dysfunctions. Pain intensity (VAS) may be too unspecific and unsophisticated a tool for measuring the association between pain disease and early adversities and warrants e.g. the measuring of pain disability instead of pain intensity as the indicator.

In both groups, a linear regression analysis was conducted to ascertain how SFs predict depressiveness. In the pain patient sample, SF1 (*Loser*) exclusively predicted depression. The effect size was 55% and was thus a little larger than in the study with a clinical sample (Hoffart et al. 2005), where Disconnection and Impaired Autonomy schema domains predicted 53% of depressiveness. When attention was paid to the common and shared EMSs, they were identical with the pain patient sample. According to this, Disconnection & Rejection and Impaired Autonomy & Performance schema domains seem to be cohesive predisposing factors for depression in clinical samples. The data suggests a salient role of early emotional trauma in the development of depression in chronic pain patients. When attention is paid to the highest loading EMSs in SF1, it seems that experiences of failure, dependency, incompetence, defectiveness, shame, social isolation and subjugation explain depression. This connects to the cognitive triad (Beck et al. 1979), namely FA, DI, DS and EM EMSs reflect a negative view of one's self, MA, ED, AB and SB EMSs express lack of confidence in others and VH EMS reflects a negative view of the future. In the control group, depressiveness was predicted by SF1 (*Endangered*) and SF3 (*Lonely*) and the model explained 31% of the variance of depression. The effect size of SF1 and SF3 was almost equal.

From the stress-diathesis point of view (Banks and Kerns 1996) childhood trauma (*Loser* in chronic pain patients) may be seen as a psychological diathesis and common to both chronic pain and depression. Schema factors 1 and 2 are two related and interacting vulnerability factors for the development of behaviour leading to pain. Pain and the consequent harm in everyday life will serve as a stressor for depression.

## 6.8 Biopsychosocial models of pain among pain patients and a painful control group

In both painful samples, EMS factors were the main predictors of depressiveness. Patterns of inadequacy, shame, submission, failure, social isolation and dependence predicted over half of depressiveness among the pain patients. The relation between pain intensity and depressiveness was the opposite in the two groups. Among the chronic pain patients, depressiveness predicted pain intensity and among the painful controls pain intensity predicted depressiveness. A major difference was found between the groups in the effect sizes of pain intensity and depressiveness on pain disability, which was the '*end state*'. Depressiveness almost exclusively predicted pain disability in the pain patient group, whereas pain intensity was the main predictor of pain disability in the control group. When the duration of pain exceeded two years, depressiveness became the sole significant predictor of pain disability in the pain patient sample. The statistical estimation method used is discussed in Section 6.10.3.

The measures indicated severe pain intensity, remarkable pain disability and mild depressiveness in the pain patient group and mild pain intensity and disability and minimal depressiveness in the control group. In the control group, women significantly outnumbered men. However, as there was only some depressiveness in the control group, and no gender differences in depressiveness, it is assumed that the difference in the number of subjects between genders does not cause concern (Keogh et al. 2006). The patient sample had shorter duration of education. First, this can be attributed to the sampling method, as the control group represented a working community and the pain patient sample also included patients pensioned due to the pain. Second, the duration of education may be inversely associated e.g. with early traumatic adversities. The groups comprised people similar in age and the cultural background.

The SF structure was not identical in the two groups. The SF structure of the chronic pain patients is discussed in subsection 6.6 (paragraphs 2-4). The SF1 included both psychological and social dimensions of life and strongly predicted depressiveness in the pain patient group (effect size 52%) and resembled the study by Hoffart et al. (2005) with mainly a clinical psychiatric sample. The SF2 reflected an '*Encumbered*' pattern and was inversely and weakly associated with pain disability. It is assumed that the unrelenting standards, hypercriticalness, approval seeking and punitiveness beliefs first work against the experience of pain disability but at the same time induce stress and delay healing processes, which, according to Finestone et al. (2008), may expose people to chronic pain. In accordance with Van Houdenhove et al. (2001b), the pain patient surpasses his

or her limits and when this continues for years his or her body becomes painful. Then, as he or she cannot perform as before, he or she succumbs to the core beliefs of SF1 (inadequate, shameful, submissive, failed, dependent and socially isolated) and becomes depressive.

Among the painful controls, the results comprised three strongly correlating SFs. SF1 consisted of all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH), and SB (Other Directedness) and NP EMSs (Overvigilance and Inhibition schema domain). The strongest loading items reflected the content of '*Endangered*' person. SF2 consisted of US, PU (Overvigilance & Inhibition schema domain), AS, SS (Other Directedness) and ET EMSs (Impaired Limits) and reflected an '*Encumbered*' role. SF3 comprised SI, ED, MA (Disconnection and Rejection schema domain) and EI EMSs (Overvigilance & Inhibition schema domain) and reflected a pattern of a '*Lonely*' person. The SF1 predicted depressiveness with an effect size of 24%. According to the data, the patterns of failure, dependency, vulnerability and pessimism were the strongest predictors of depressiveness in the control group. In both groups, depressiveness was mainly predicted by early maladaptive schema factors, but the effect size was two times larger in the pain patient group. It is suggested that among chronic pain patients there is a strong possibility of early psycho-social adversities which in turn may predispose to depressiveness. Also, this reflects the vast association between a person's belief system and the meaning organization of depressiveness.

The relation between pain intensity and depressiveness was opposite between the groups. According to the results, the greater the chronic pain patient's depressiveness, the greater his/her perceived pain intensity. The effect size of depression on pain intensity was 7%. In the control group, pain intensity predicted depressiveness and the effect size was 5%. Thus it would be tempting to suggest that in mild states of pain (the control group), pain intensity increases depressiveness and in clinical states of pain (the pain patient group) the chain of events is the opposite and depressiveness exacerbates pain intensity. The estimates support consequence theory (pain precedes depression) in the control group (Fishbain et al. 1997) but also the idea of antecedent theory (depression precedes pain) in the pain patient group (Currie and Wang 2005). However, these two groups probably reflect two different types of subgroups with two different outcomes. A possible explanation mechanism, referring to the diathesis-stress model (Dworkin et al. 1999, Dersh et al. 2001), is that chronic pain patients have psycho-social diathesis [SF1=*Loser*'] and the stress of chronic pain triggers the depression which in turn compounds disability (Börsbo et al. 2009) and deficiency in the descending inhibitory system of pain (de Souza et al. 2009).

In the pain patient group, depressiveness predicted both pain intensity and pain disability and the effect size ratio of depressiveness and pain intensity on pain disability was eleven to one. In recent

studies among surgically treated lumbar spinal stenosis patients, depression has predicted the one- and two-year outcome of disability (Sinikallio et al. 2009, 2011). Perhaps to treat pain disability among chronic pain patients is mainly to treat their depression, which may also decrease their pain intensity. The modified model by Arnstein (2000) was vindicated in the control sample. Pain intensity predicted depressiveness to a small degree and was the main predictor of pain disability, which was the 'end state' of the variables used. The ratio of the effect sizes of pain intensity and depressiveness on pain disability was almost six to one among the painful controls. This would suggest that in the mild stages of pain to treat pain is the way to alleviate pain disability and depressiveness. Among the chronic pain patients, the mediation data suggests that the beliefs of incompetence, defectiveness, failure and subjugation (*Loser*) are predicting pain intensity. From the pain-brain point of view, decreased experience of self-management and control may thus decrease the activity in the modulatory descending inhibitory system (e.g. Wiech et al. 2008). Self-control as opposed to external control over pain has been shown to reduce pain intensity, also seen as decreased pain-related responses in the ACC and insula (Salomons et al. 2004). Perhaps early adversities organise the way insular and AC cortices modulate the sensory, afferent pain data. With the *Loser's* role, also, one cannot make positive reappraisals about coping with pain, and thus the suggested VLPFC and DLPFC do not modulate and induce the activation of the descending inhibition of pain (Wiech et al. 2008). Literally, the items in PDS reflect the situation where one has handed over the control of life [*pain disables my life*] to the pain.

## 6.9 Effect of the duration of pain on the biopsychosocial pain model among chronic pain patients

When the duration of pain exceeded two years the effect of pain intensity on pain disability vanished and depressiveness became the sole predictor of disability. Thus the results indicated the salient role of depressiveness in pain disability. Also, depressiveness and pain intensity no longer had an effect on each other when the pain had lasted longer than two years. When the duration of pain increased, the effect size of SF1 on depressiveness increased from 45% to 58% and indicated a close relationship between the patterns of inadequacy, shame, submission, failure, social isolation, dependence and depressiveness in the temporally longer states of pain. The SF2 had a negative effect on pain disability, but only when the pain had lasted two years or less. Is SF2 paradoxal - it first acts against pain disability but at the same time impedes the healing of the painful body?

Two thirds of the variance of pain disability could not be explained in this study. The Pain Disability Scale (PDS) is a fairly easy measure for pain patients to fill in as they can attribute all the limitations in their lives to pain. It may be much more difficult for the first-time visitor to describe his/her depression (BDI-II) or intimate feelings and thoughts (YSQ-S2-extended). Patients are often afraid that their pain is believed to be all in their heads, probably because of earlier experiences, and because of the body-mind dualistic view of biomedical medicine (Sullivan 2001, Quintner et al. 2008, Crowley-Matoka et al. 2009). In the doctoral dissertation by Kuusinen (2004), pain intensity and depressiveness were not associated among pain patients in a rehabilitation process. Kuusinen found a strong predictive value of pain intensity on disability and also suggested that disability predicts depression. However, his design was not exploratory, as the models were constructed such that depression was the '*end state*'. In his study, pain disability was measured with items which also included descriptions of emotionality, namely suffering, satisfaction and contentment.

## 6.10 Consideration of some of the statistical methods used

### 6.10.1 Confirmation of the YSQ-S2-extended

The confirmatory factor analysis of the YSQ-S2-extended showed that the parcelled model with the 18 latent EMS factors gave the best indices of all the models. It also had the best sample to item ratio. Parcelling has its drawbacks and advantages. The first area of concern surrounds the dimensionality of a construct and the potential pitfalls of a misspecified factor model. Parcelling should be considered under conditions of unidimensionality, which, however, is what the individual EMS subscale schema items are based on. Parcelling may increase Type II error rate by reducing the ability to identify misspecified models. On the other hand, it also has many psychometrically grounded advantages. When using skewed and kurtotic data, parcelling reduces the violations to distribution. When using ordinal and discrete data, scales move from ordinal towards more continuous scales as the scale intervals increase in number. The models are more parsimonious, having fewer estimated parameters, all of these increasing the psychometric merits. Just-identified models increase stability (Little et al. 2002). Parcelling was the only way to test the large 18-EMS model. Although Rijkeboer and Bergh (2006) also used parcelled models, the statistics of that study could not be compared because of a different estimation method (Maximum Likelihood=ML) and item (2\*97) and EMS (16) number. The statistics ( $X^2/df$  and RMSEA) of their best model (tau-equivalent) are parallel with this study. Baranoff et al. (2006) used CFA in their Korean and

Australian samples, but again the ML method and different factor structure (13 and 15) made it impossible to fully compare the results. However, their 75-item 15-EMS model gave quite comparable  $X^2/df$  fit-indices and slightly more unsatisfactory RMSEA and SRMR indices than the model #1(YSQ-S2-extended). Most of all, these studies confirmed the 15, 16 and 18-EMS factor structure of YSQ in different languages, namely Dutch, Korean (Hanguk Mal), English and Finnish.

The goodness-of-fit indices did not differ between the pain patient and control groups and in all cases they showed a good model fit except in SRMR, which showed acceptable fit. Individual item loadings proved to be over 0.50 in both groups. The squared multiple correlations (except AS #80 in the pain sample) had acceptable values, indicating good measuring quality of the individual schema items. The reliability of the scale measured by internal consistency was adequate to high in both samples.

Statistically, the data of the YSQ is cumbersome. The maximum likelihood (ML) and general least squares (GLS) estimation approaches rely on the assumption of multivariate normality and continuous data (Muthén 1984). However, in practice these assumptions are often violated in different kinds of questionnaire data (Hu et al. 1992). As the items of the YSQ have values which are discrete, ordinal and usually positively skewed in normal population, the data violate the assumptions of ML or GLS estimations (Lee et al. 2005). In the case of ordinal data, the polychoric correlation matrix is recommended (Olsson 1979, Jöreskog and Sörbom 1981, Jöreskog 1990). According to Quiroga (1992), Flora and Curran (2004) in even moderately skewed and kurtotic data the polychoric estimate was only less than 4% over-biased. Thus the polychoric correlation estimation used with this data was reliable and a little over-biased. Flora and Curran (2004) and Wang and Cunningham (2005) suggested that the method of choice for analysing ordinal, nonnormal data is diagonally weighted least squares estimation (DWLS), which uses the polychoric correlation matrix and is reportedly quite a stable and reliable method even in smaller sample sizes when compared with the weighted least squares (WLS) method. The chi-square statistics are a little inflated leading to type I error and rejection of the model. The increasing number of indicators in the model leads to the overestimation of parameters in WLS but there is no such effect of model size on parameter estimation with DWLS. Parameter estimates (both factor loadings and factor correlations) seem to be affected by non-normality, but the effect is small. The estimates in this study are positively biased, but according to Flora and Curran (2004) by less than 5%. The standard errors are usually slightly negatively biased. Thus the parameter estimations can be kept reliable as the kurtosis and skewness were within the limits described by Quiroga (1992), Flora and Curran (2004) and the sample size was large. The DWLS estimation method used here gave stable item loadings in two separate models, which had 12 shared EMS subscales and 60 shared items.

### 6.10.2 Exploring the latent, second order factor structure of the YSQ-S2-extended

The study by Calvete et al. (2005) consisted of 15 contemporary EMSs also included in the YSQ-S2-extended. Based on this, PCA with Varimax rotation was performed with the same 15 EMSs to confirm the validity of the data used in this dissertation. The analysis suggested a three-component second-order structure in the control sample, which was identical in the order of components and total variance explained and almost identical in component structure and cross-loadings compared with the data of Calvete et al. (2005). This suggested a fairly uniform second-order schema factor structure in different non-clinical samples and age groups in different nations and justified the validity of the data to perform the study.

As there are no second-order EFA or CFA studies with the contemporary 18 EMS factor structure, the results are difficult to compare. The factor structure of chronic pain patients comprised two factors and no EMSs needed to be excluded. It bore no resemblance to earlier studies. The first EFA study with the largest sample size (Schmidt et al. 1995; 1,129 students) comprised three second-order factors as did the factor structure of the control sample in this study. Eight EMSs were divided into similar factors. However, after their study, some of the EMSs have different names or no longer exist. The control sample in this study resembled that in the study by Lee et al. (1999), where three second-order factors contained mainly the same EMSs (11 EMSs in similar factors). However, Lee et al. had a fourth factor, which consisted of Fear of Loss of Control and ET EMSs; the former no longer belongs to the YSQ. In the study by Cecero et al. (2004) there were 10 EMSs in factors similar to this study, but they, too, had a fourth factor consisting solely of ET EMS.

The sample to variable ratio varied across the EFA studies and was greatest (87/1) in the study by Schmidt et al. (1995). There are two second-order schema factor CFA studies. Hoffart et al. (2005, clinical sample, N=888, mean age < 40 years) confirmed the factor structure reported by Lee et al. (1999). Calvete et al. (2005, students, N=407) confirmed a three-factor model and the first and the second factors shared all EMSs included in the first factor (*Loser*) of the chronic pain patients. The third factor in that study consisted of the same EMSs as the SF2 of the pain patients except PU, AS, NP EMSs, which were not included in their study. When comparing the three-factor structure of Calvete et al. (2005) with the three-factor structure of the control group in this study, the resemblance is most striking of all the aforementioned studies.

In the studies by Schmidt et al. (1995) and Lee et al. (1999) the EFA method used was principal component analysis (PCA) and the rotation method orthogonal (Varimax). The EFA method (PAF)



and the rotation (oblique) used in this study were the same as in the study by Cecero et al. (2004). According to the strict norms, PCA is not a pure factor analysis method (Hatcher 1994). However, when the number of measured variables increases principal axes factors and principal components tend to be more and more similar (Ogasawara 2000). PCA is a method to linearly combine observed variables into a component and suits best when selecting and reducing items from a larger item pattern. PAF is a true factoring method and as such is better suited to seeking the latent, underlying factors that are responsible for the covariation of the data. In the study by Hoffart et al. (2005) it was shown that the second-order factors (schema domains) correlated to a significant degree. Based on the aforementioned, PAF and oblique rotation were used.

### 6.10.3 Model estimation method in path-analysis

All the variables used in the path analyses had normal distribution in skewness and kurtosis and when plotted showed visual normality. The data did not quite reach multinormality in the control group. However, maximum likelihood (ML) was used as the path analysis estimation method. ML attains optimal asymptotic properties, namely, that the estimates are normally distributed, unbiased and efficient. The slight lack of multinormality in the control group data may underestimate standard errors and overestimate the likelihood ratio of chi-square statistics. It does not, however, affect the parameter estimates (Kaplan 2009). Also, the aim was to estimate two models in the same group, as the group comparisons between the pain patient and control groups were not possible because of a different schema factor structure. ML estimation method was therefore used.

## 6.11 Limitations and strengths of the study

This study has several limitations. First, this study lies on the self-report method of analysis. Many of the EMSs not evaluated here may also be relevant to the development of or coping with a chronic somatic condition such as chronic pain. These findings call for qualitative studies of the pain patients' stories and speech for a better EMS analysis. Second, the word 'depression' is used in this study although it was measured with the BDI-II. Unfortunately it was not possible to conduct an ordinary psychiatric interview because the sample was gathered from several pain clinics by many different physicians not specialised in psychiatry. Pain patients are also highly sensitive to psychiatric enquiries, believing that their pain is not taken seriously. A structured interview would

be a more specific method of evaluating depression. Third, as the 18-EMS-model is fairly complex the statistical power would have been even better if the sample size had been larger. Fourth, the control group differed in gender distribution and education level from the pain patient sample. However, Rijkeboer et al. (2005) found no bias or corresponding tendency with different gender or education levels. Fifth, the items of every subscale were grouped together in the YSQ-S2-extended version used. This may well have biased the answering tendency in respondents and increased the model fitness compared with the study by Rijkeboer and Bergh (2006). However, it was in the original order of the YSQ-S2 (Young and Brown 2003b) and ready for clinical assessment for individual patients in an outpatient set. In populations with somatic symptoms, like chronic pain, the activation of a single psychological issue may be difficult or prohibited. A grouping of a single concept or proposition can serve to bring to consciousness many other concepts or propositions to which it is closely related (Segal et al. 1996). Thus the grouping can better activate the introspection of different psychological issues of the pain patients.

Sixth, the limitations of this study also lie in the cross-sectional study design. Prospective and follow-up analyses yield a more exhaustive picture of the causes and effects. As this study was cross-sectional it can only be indicative of the specific causal relationships between EMSs, depression, pain characteristics and pain disability. However, the assessment of the content of the speech of chronic pain patients revealed several ways in which meaningful schemas affected their behaviour in a way that exacerbated their pain. Seventh, the pain disability scale used in this study can be seen as a limitation. It was based on a pain disability scale used in many pain clinics in northern Finland. The pilot study, however, showed equal properties between PDS and PDI.

This study has many strengths. The YSQ-S2-extended and the BDI-II are validated in Finnish language. The groups were large. The study sample was collected from several pain clinics from different types of public hospitals in Finland and the proportion of patients declining to participate was low. The age range represented typical pain patient distribution. The pain diagnoses varied and did not represent narrow categories. I therefore venture to suggest that the results represent Finnish chronic pain patients fairly well. The control sample was large and reflected a culturally equal and age matched sample.

The required case/parameter ratio was sufficient for the exploratory and path analysis estimation methods used. The models tested gave a satisfactory view of the different causes and effects between the variables observed. Two different populations in two different pain states gave a good opportunity to study the connection between schema factors, pain intensity, depressiveness and pain disability. To the best of my knowledge, this was also the first research to study the effects of EMS factors on depressiveness and pain disability in a pain population with a path-analysis method. The

subgroups of pain duration extended the view of the close relationship between EMS factors, depressiveness and pain disability among chronic pain patients.

## 7. Conclusions and implications for the future

### 7.1 Conclusions

The Finnish Young Schema Questionnaire (YSQ-S2-extended) showed adequate internal consistency both in chronic pain patient and control samples. The confirmatory factor analysis lent support to the 18 EMS factor structure proposed by Young (1999) and Young et al. (2003). The loadings of individual EMS items were all significant. The YSQ-S2-extended can be used reliably in Finnish chronic pain patients and control samples. More than half of chronic pain patients may suffer from early emotional trauma manifested as a meaningful (active) EMS which may also have a harmful effect on their behaviour. Those patients with meaningful EMS(s) had significantly higher pain intensity, duration of pain and pain disability. In men and women Unrelenting standards/ Hypercriticalness (US) and Self-Sacrifice (SS) EMSs were scored mostly as meaningful. In their narratives, the patients with meaningful US and SS EMSs showed pain behaviour exacerbating the pain problem. This connects to the studies where stressful life will predispose a person to chronic pain. Emotional Deprivation EMS in the pain patient sample was associated with pain disability as much as pain intensity and number of pain sites. Compared to the control sample chronic pain patients showed EMSs reflecting inability to perform and manage alone, but also pessimistic and catastrophic beliefs. This is associated with the contemporary findings about the important modulatory roles of ACC, insula and VLPFC in pain perception. Pain disability was the pain variable which was most associated with EMS variation. Those patients with severe pain disability had an increase in the Disconnection and Rejection schema domain reflecting early psychological maltreatment, such as emotional abuse, neglect and abandonment. Suppression of spontaneous feelings and rigidity of thoughts was also seen among them. Chronic pain patients with severe pain intensity or pain disability showed an increase in the Impaired Autonomy and Performance schema domain.

Among chronic pain patients, two latent schema factors were found. The first and larger SF1, labelled *Loser*, reflected a shameful, defective, socially isolated, failure, emotionally inhibited, deprived, submissive and resigned pattern. The second SF2, labelled *Encumbered*, showed a

demanding, approval seeking, self-sacrificing and punitive pattern. The control group showed a three-factor pattern, with similarities to earlier studies. In chronic pain patients, the Loser's pattern was strongly associated with their depressiveness. When using the path-analysis method for different subgroups of chronic pain patients, the longer the duration of the pain was, the greater was the predictive effect of *Loser's* pattern on depressiveness. The data supported the view that early adversities predispose chronic pain patients to depressiveness. The patterns of the SF2 may predispose a person to chronic pain via impaired body healing.

According to the different path-analyses, the best statistical support was given to a model in which pain disability was the '*end state*'. The relation between pain intensity and depressiveness was the opposite in the two study groups. In the pain patient group, depressiveness predicted pain intensity and in the control group, pain intensity predicted depressiveness. In the pain patient group, it was depressiveness and in the control group it was pain intensity which was the main predictor of pain disability.

## 7.2 Clinical implications

1. The YSQ-S2-extended with 18 EMSs can be used among Finnish chronic pain patients.
2. The pain patients with meaningful or high scored US and SS EMSs should be calmed down so that their painful bodies could get some rest and the tissues get time to heal. More generally, the opportunity to learn about the pain perpetuating lifestyle and to understand the way US and SS EMSs may serve as a trap for even iatrogenic traumatization, can help pain treating personnel and pain patients to find more adaptive ways to cope.
3. The occurrence of patterns of inability to perform and manage alone is exacerbated among chronic pain patients. These patterns are associated with passive coping methods, which have been shown to delay healing from pain. Thus active rehabilitation methods are more appropriate for them. Those patients with pessimistic and catastrophic beliefs should be convinced of the favourable effects of aerobic training to prognosis, for example.
4. For those pain patients with severe pain disability, treatment with cognitive-behavioural or SFT should be considered focusing on their depression and experiences of early emotional abuse, neglect and abandonment.

5. We should calm down the '*Encumbered*' patients to get them relaxed and get their suffering bodies to heal. We should also be able to support the ashamed, failed, dependent, incompetent, negative and vulnerable ones ('*Losers*') to feel dignity and thereby relieve their depression.
6. In light of this data, the pain intensity should be the main focus of treatment in the mild states of pain. Among chronic pain patients, the role of depressiveness is important and may even be the main focus of treating pain disability, especially when the duration of pain increases. Among severely depressed chronic pain patients, SFT can be one choice more for better outcomes in treating pain intensity and disability.
7. Cognitive factors have been shown to be associated with the chronicity of pain. We are allowed to believe that our early experiences mold our plastic brains in a way that predisposes us to or pre-empts us from pain, depression or disability. The consequent maladaptive belief patterns and the behaviour which follows them may first inhibit us from relaxing our painful bodies and later on subject us to the many features of depression and disability.

### 7.3 Implications for future studies

Longitudinal studies are needed to ascertain how EMSs, latent EMS factors and depressiveness are interwoven. Is the path always from EMS to depression, or are EMSs and depressiveness a spiral process, where each contribute to the other? Treatment studies may also shed light on the causal processes among SFT. It would be interesting to know how specific these EMS patterns are for chronic pain patient populations and to compare them with patients with other chronic somatic diseases.

The causal relationship between pain and depression seems to be an everlasting dilemma. I believe that functional magnetic resonance and positron emission tomography studies with fine study designs will yield further information on the brain processes of these two huge public health concerns. More than to solve the '*chicken and egg*' situation there should be an emphasis on seeing their importance both to the pain patient and to the pain treating personnel to have a common language and understanding that chronic pain is a crucial nervous process and chronic pain and depression '*go together well*'. EMSs would be one piece more for the designs to carry in fMRI studies exploring how early adversities, emotions and beliefs modulate the way the brain manages the sensory pain information and perception. Futuristically, maybe, EMSs would serve as one way more to study if chronic pain and depressive thinking are interwoven into the same matrix.

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During the darkest nights of December 2011,

Tom



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# Appendix

## TÄYTTÖOHJEET:

## YSQ- S2 – extended

Alla on väittämiä, joilla ihmiset kuvailevat itseään. Ole hyvä ja lue jokainen väittämä ja arvioi kuinka hyvin se kuvaa sinua. Jos olet epävarma, päätä sen mukaan, miltä sinusta tuntuu eikä sen mukaan, mitä saattaisit pitää järkevimpänä.

Valitse kunkin väittämän kohdalla arviointiasteikon vaihtoehtoista 1 - 6 se, joka kuvaa parhaiten sinua ja merkitse se väittämän edessä olevalle viivalle.

### ARVIOINTIASTEIKKO:

- 1 = Ei kuvaa minua lainkaan
- 2 = Ei juurikaan kuvaa minua
- 3 = Kuvaa minua vähän
- 4 = Kuvaa minua kohtalaisesti
- 5 = Suurimmaksi osaksi kuvaa minua
- 6 = Kuvaa minua täysin

*(Esimerkki: A. 5 Olen huolissani siitä, että kiputilani pahenee vuosien mittaan.)*

- 1. \_\_\_\_\_ Enimmäkseen minulla ei ole ollut ketään, joka huolehtisi minusta, jakaisi aikansa kanssani tai välittäisi syvällisesti kaikesta, mitä minulle tapahtuu.
- 2. \_\_\_\_\_ Yleisesti ottaen lähelläni ei ole ollut ihmisiä, jotka olisivat antaneet minulle lämpöä, pitämistä tai kiintymystä.
- 3. \_\_\_\_\_ Minusta on tuntunut suurimman osan aikaa elämästäni, että en ole erityisen tärkeä kenellekään.
- 4. \_\_\_\_\_ Useinkaan minulla ei ole ollut ketään, joka todella kuuntelisi minua, ymmärtäisi minua tai olisi samalla aaltopituudella.
- 5. \_\_\_\_\_ Minulla on ollut hyvin harvoin ketään vahvaa persoonaa, joka olisi antanut minulle hyviä ohjeita tai neuvoja ollessani epävarma ja neuvoton.

*\*ed*

- 6. \_\_\_\_\_ Huomaan takertuvani minulle läheisiin ihmisiin, koska pelkään heidän jättävän minut.
- 7. \_\_\_\_\_ Pelkään minulle läheisten ihmisten hylkäävän minut.
- 8. \_\_\_\_\_ Kun huomaan, että ihminen, josta välitän, vetäytyy pois luotani, tulen epätoivoiseksi.
- 9. \_\_\_\_\_ Joskus olen niin huolissani jätetyksi tulemisesta, että itse ajan ihmiset pois luotani.
- 10. \_\_\_\_\_ Tarvitsen muita ihmisiä niin paljon, että pelkään menettäväni heidät.

*\*ab*

- 11. \_\_\_\_\_ Minusta tuntuu, että ihmiset yrittävät hyötyä minusta.
- 12. \_\_\_\_\_ Minun on oltava jatkuvasti varuillani muiden läsnä ollessa, muutoin he voivat loukata minua tarkoituksellisesti.
- 13. \_\_\_\_\_ On vain ajan kysymys milloin joku pettää minut.
- 14. \_\_\_\_\_ Epäilen suuresti muiden ihmisten tarkoituksia.
- 15. \_\_\_\_\_ Olen usein varuillani ihmisten perimmäisten motiivien suhteen.

*\*ma*

- 16. \_\_\_\_\_ En sovi muiden joukkoon.
- 17. \_\_\_\_\_ Olen pohjimmiltani erilainen kuin muut.
- 18. \_\_\_\_\_ En kuulu mihinkään, olen kuin yksinäinen susi.
- 19. \_\_\_\_\_ Tunnen vieraantuneeni muista ihmisistä.
- 20. \_\_\_\_\_ Tunnen aina olevani ryhmän ulkopuolella.

*\*si*

21. \_\_\_\_\_ Kukaan haluamani mies/nainen ei voisi rakastaa minua nähtyään puutteeni.  
22. \_\_\_\_\_ Kukaan haluamani mies/nainen ei haluaisi jäädä luokseni, jos hän tuntisi todellisen minäni.  
23. \_\_\_\_\_ En ole muiden rakkauden, huomion tai kunnioituksen arvoinen.  
24. \_\_\_\_\_ Minusta tuntuu, etten ole rakastettava.  
25. \_\_\_\_\_ Olen pohjimmiltani sellainen, jota ei voi hyväksyä, enkä näin ollen voi avautua muille.

*\*ds*

26. \_\_\_\_\_ En osaa tehdä juuri mitään yhtä hyvin kuin muut (työssä tai koulussa).  
27. \_\_\_\_\_ Olen kyvytön, kun on kyse saavutuksista.  
28. \_\_\_\_\_ Useimmat ihmiset ovat minua kyvykkäämpiä työssä ja saavutuksissa.  
29. \_\_\_\_\_ En ole yhtä lahjakas kuin useimmat muut työssään.  
30. \_\_\_\_\_ En ole yhtä älykäs kuin muut työssä tai opinnoissa.

*\*fa*

31. \_\_\_\_\_ Minulla on tunne, etten pysty selviytymään omin avuin jokapäiväisestä elämästä.  
32. \_\_\_\_\_ Pidän itseäni muista riippuvaisena henkilönä, silloin kun kyse on arkipäivän toiminnoista.  
33. \_\_\_\_\_ Minulta puuttuu niin sanottua maalaisjärkeä.  
34. \_\_\_\_\_ Arvostelukykyyäni ei ole luottamista jokapäiväisissä tilanteissa.  
35. \_\_\_\_\_ En luota kykyyäni ratkaista eteen tulevia arkipäivän ongelmia.

*\*di*

36. \_\_\_\_\_ En voi välttää tunnetta, että jotain kauheaa tulee tapahtumaan.  
37. \_\_\_\_\_ Minusta tuntuu, että jokin onnettomuus (luonnonmullistus, rikos, vararikko tai sairaus) voi iskeä minä hetkenä tahansa.  
38. \_\_\_\_\_ Olen huolissani siitä, että kimppuuni hyökätään.  
39. \_\_\_\_\_ Olen huolissani siitä, että menetän kaikki rahani ja minusta tulee köyhä.  
40. \_\_\_\_\_ Pelkään, että minulle on kehittymässä vakava sairaus, vaikka lääkäri ei olekaan todennut mitään erityistä.

*\*vh*

41. \_\_\_\_\_ En ole kyennyt itsenäistymään vanhemmistani samalla tavalla kuin ikäiseni.  
42. \_\_\_\_\_ Vanhempani ja minä olemme liiaksi kietoutuneet toistemme elämään ja ongelmiin.  
43. \_\_\_\_\_ Sekä vanhempieni että minun on hyvin vaikeata olla kertomatta luottamuksellisia asioita toisillemme tuntematta siitä syyllisyyttä.  
44. \_\_\_\_\_ Minusta usein tuntuu siltä, että minulla ei ole erillistä minuutta vanhempiini tai kumppaniini nähden.  
45. \_\_\_\_\_ Usein minusta tuntuu siltä, että vanhempani elävät kauttani -minulla ei ole omaa elämää.

*\*em*

46. \_\_\_\_\_ Jos tekisin, mitä haluan, niin etsisin itselleni vain pelkkiä vaikeuksia.  
47. \_\_\_\_\_ Minusta tuntuu, ettei minulla ole muuta mahdollisuutta kuin myöntyä toisten toiveisiin tai muutoin he kostavat tai hylkäävät minut.  
48. \_\_\_\_\_ Ihmissuhteissani annan muiden olla niskan päällä.  
49. \_\_\_\_\_ Olen aina antanut toisten tehdä valinnat puolestani, joten en todellisuudessa tiedä, mitä itse haluan.  
50. \_\_\_\_\_ Minun on todella hankalaa vaatia, että oikeuksiani kunnioitetaan ja että tunteeni otetaan huomioon.

*\*sb*

51. \_\_\_\_\_ Tavallisesti olen se ihminen, joka päätyy huolehtimaan läheisistään.  
52. \_\_\_\_\_ Olen hyvä ihminen, koska ajattelen muita enemmän kuin itseäni.  
53. \_\_\_\_\_ Vaikka olisin kuinka kiireinen, löydän aina aikaa muille.  
54. \_\_\_\_\_ Olen aina ollut se, joka kuuntelee kaikkien muiden ongelmia.  
55. \_\_\_\_\_ Muiden mielestä teen liian paljon muiden hyväksi enkä tarpeeksi itseni hyväksi.

*\*ss*

56. \_\_\_\_\_ Olen liian vaivautunut osoittamaan myönteisiä tunteita muita kohtaan (esim. kiintymystä, välittämistä).  
57. \_\_\_\_\_ Minusta on hämmentävää ilmaista tunteitani muille.  
58. \_\_\_\_\_ Minusta on vaikeata olla lämmin ja spontaani.  
59. \_\_\_\_\_ Kontrolloin itseäni niin paljon, että muut pitävät minua tunteettomana.  
60. \_\_\_\_\_ Muut näkevät minut kireänä ja niukasti tunteitani osoittavana.

*\*ei*

61. \_\_\_\_\_ Minun pitää olla paras kaikessa; en hyväksy toiseksi jäämistä.  
62. \_\_\_\_\_ Yritän tehdä parhaani; vähempi ei kelpaa.  
63. \_\_\_\_\_ Minun on täytettävä kaikki velvollisuuteni.  
64. \_\_\_\_\_ Otan jatkuvasti paineita siitä, että saan asiat hoidetuksi.  
65. \_\_\_\_\_ En salli, että pääsen helposti pälkähästä tai pyytelen anteeksi virheitäni.

*\*us*

66. \_\_\_\_\_ Minun on vaikeata hyväksyä "ei" -vastausta, kun haluan jotain muilta ihmisiltä.  
67. \_\_\_\_\_ Olen erityistapaus eikä minun pitäisi hyväksyä moniakaan niistä rajoituksista, joita ihmisille asetetaan.

68. \_\_\_\_\_ Vihaan sitä, että minua rajoitetaan tai estetään tekemästä, mitä haluan.  
 69. \_\_\_\_\_ Minusta tuntuu, että minun ei tulisi noudattaa sääntöjä ja sopimuksia, joita muut normaalisti noudattavat.  
 70. \_\_\_\_\_ Mielestäni se, mitä minulla on tarjottavana, on merkittävämpää kuin muiden aikaansaannokset.

*\*et*

71. \_\_\_\_\_ Minulla ei näytä olevan itsekuria tehdä loppuun rutiinimaisia tai tylsiä tehtäviä.  
 72. \_\_\_\_\_ Jos en voi saavuttaa päämäärää, turhaudun helposti ja luovutan.  
 73. \_\_\_\_\_ Minun on hyvin vaikeata luopua välittömästä tyydytyksestä saavuttaakseni pitkän aikavälin päämäärän.  
 74. \_\_\_\_\_ En voi pakottaa itseäni tekemään sellaista, josta en nauti vaikka se olisi omaksi parhaakseni.  
 75. \_\_\_\_\_ Olen kyennyt vain harvoin pysymään omissa päätöksissäni.

*\*is*

76. \_\_\_\_\_ Minulle on tärkeää, että lähes kaikki tuntemani ihmiset pitävät minusta.  
 77. \_\_\_\_\_ Aikaansaannoksistani tulee arvokkaampia, jos toiset ihmiset huomioivat ne.  
 78. \_\_\_\_\_ Minun on vaikea asettaa omia tavoitteitani, ottamatta huomioon miten muut reagoivat valintoihini.  
 79. \_\_\_\_\_ Olen elämässäni tehnyt päätöksiä niin, että olen saanut niille toisten ihmisten hyväksynnän.  
 80. \_\_\_\_\_ Kiitokset ja kohteliaisuudet saavat minut tuntemaan itseni arvokkaaksi.

*\*as*

81. \_\_\_\_\_ Vaikka asiat näyttävät menevän hyvin, se tuntuu minusta vain väliaikaiselta.  
 82. \_\_\_\_\_ Jos jotakin hyvää tapahtuu, olen huolissani siitä, että jotakin pahaa on todennäköisesti tulossa.  
 83. \_\_\_\_\_ Ei voi olla liian huolellinen; jokin voi mennä aina pieleen.  
 84. \_\_\_\_\_ Kiinnitän enemmän huomiotani kielteisiin kuin myönteisiin puoliin elämässä ja asioissa.  
 85. \_\_\_\_\_ Läheiseni pitävät minua murehtijana.

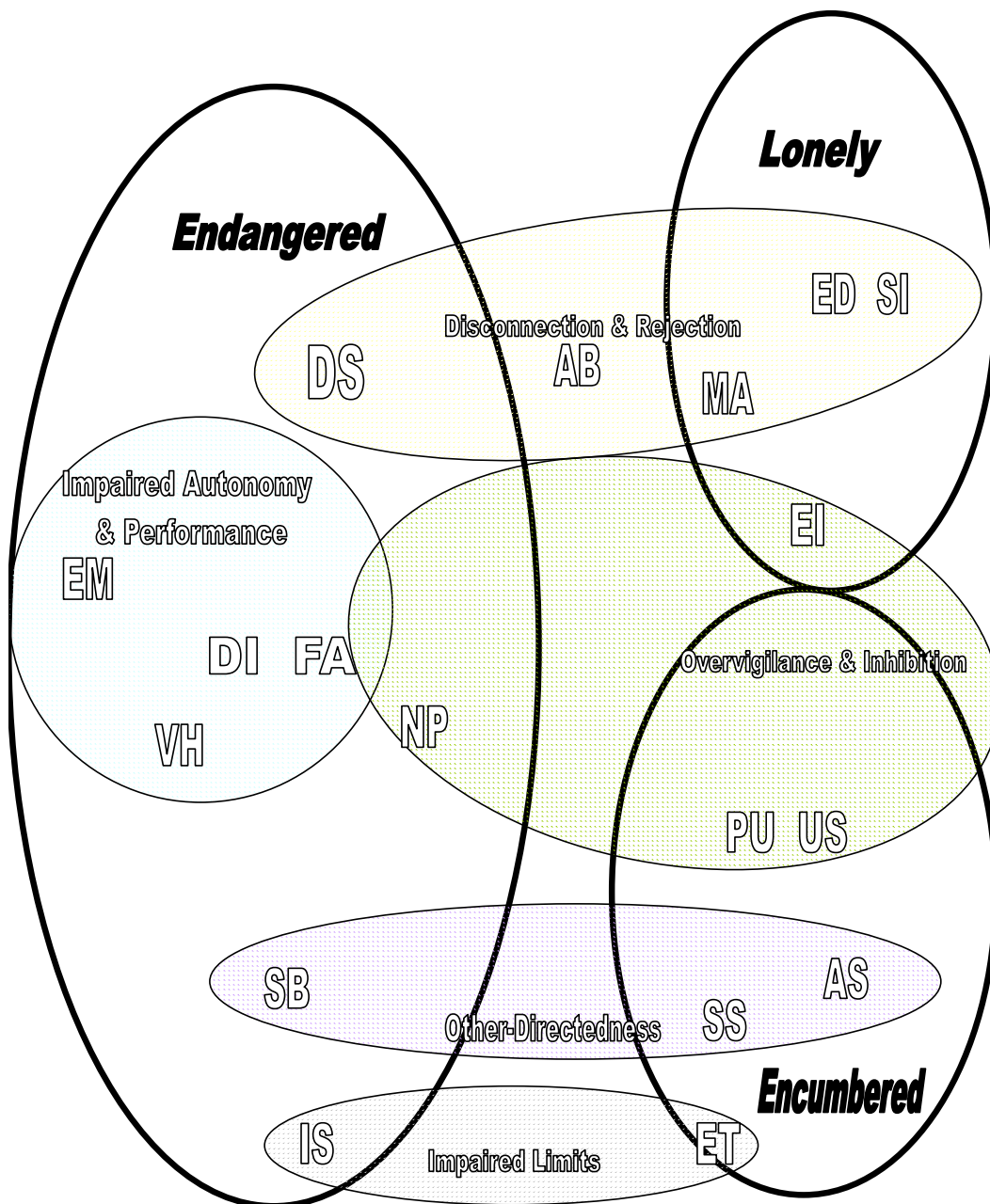
*\*np*

86. \_\_\_\_\_ Jos en yritä parastani, minun ei pidä luullakaan onnistuvani.  
 87. \_\_\_\_\_ Ei ole olemassa puolusteluja, jos teen virheen.  
 88. \_\_\_\_\_ Ihmisiä, jotka eivät hoida osaansa, tulee rangaista jollakin tavalla.  
 89. \_\_\_\_\_ Ajattelen tekemiäni virheitä usein ja vihaan itseäni.  
 90. \_\_\_\_\_ Jos en hoida omaa osuuttani, minun pitää kärsiä seuraukset.

*\*pu*

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**Figure:** *Lonely, Endangered and Encumbered*: the three SFs among the control group and the overlap with the five schema domains described by Young et al. (2003). Notes: Emotional Deprivation = ED. Abandonment/Instability = AB. Mistrust/ Abuse = MA. Social Isolation/ Alienation = SI. Defectiveness/ Shame = DS. Failure = FA. Dependence/ Incompetence = DI. Vulnerability to Harm or Illness = VH. Enmeshment/ Undeveloped Self = EM. Entitlement/ Grandiosity = ET. Insufficient Self-Control/Self-Discipline = IS. Subjugation = SB. Self-Sacrifice = SS. Approval-Seeking/ Recognition-Seeking = AS. Emotional Inhibition = EI. Unrelenting Standards/ Hypercriticalness = US. Negativity/ Pessimism = NP. Punitiveness = PU.

## Original communications



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# The psychometric properties of the Finnish Young Schema Questionnaire in chronic pain patients and a non-clinical sample

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## ABSTRACT

We investigated the latent factor structure of the Finnish Young Schema Questionnaire (YSQ-S2-extended; short form) in samples of chronic pain patients ( $n = 271$ ) and controls ( $n = 331$ ) with confirmatory factor analysis (CFA). The data in the total sample supported the 18-factor structure as hypothesized by Young, J. E., Klosko, J., & Weishaar, M. E. (2003). *Schema therapy: A practitioner's guide*. New York: Guilford Press. The diagonally weighted least squares estimation method gave repeatable parameter estimates in successive confirmatory factor analyses (CFA). The internal consistency of the YSQ-S2-extended was adequate to high in both samples and the groups showed equal goodness-of-fit statistics in CFA. This study consisted of the oldest population so far (mean age 47 years) and supported the use of the Finnish version of the YSQ-S2-extended in clinical practice.

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## 1. Introduction

Schemas form the core of the individual's self-concept and guide the information regarding the self and the environment (Beck, Rush, Shaw, & Emery, 1979). In cognitive psychotherapy schemas are regarded as relatively stable cognitive patterns forming the basis for the regularity of interpretations of

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how a person conceptualises a particular set of situations. Young based his schema-focused therapy on the schema issue (Young, 1990, 1999). Early childhood experiences lay the foundation for the individual's patterns and models about the self, others and the world. Every child needs nurturing, safety, love, understanding and acceptance for the innate needs to be met. If this fails and the needs of the child are neglected, if the child is abused or otherwise maltreated, s/he develops adaptive schemas for that life situation to cope and survive, but later in life these become maladaptive. These “survival” schemas are defined as “broad pervasive themes regarding oneself and one's relationship with others, developed during childhood and elaborated throughout one's lifetime and dysfunctional to a significant degree” (Young, Klosko, & Weishaar, 2003). They are called Early Maladaptive Schemas (= EMS; see Table 1). Young and Klosko (1994) hypothesized that EMSs are present in every individual. The most recent development of schema-focused therapy (Young, 1999; Young et al., 2003) proposes existence of 18 EMSs, of which 13 are called unconditional reflecting fixed beliefs about self and others and are proposed to develop earliest in life. Stallard (2007) assessed 12 EMSs and found a temporal stability in eight of them in children aged 9–18 years. Seven of the EMSs were unconditional and one was conditional. The study supported the view of the development and stabilization of EMSs at an early age and the proposal that the unconditional EMSs develop earlier than the conditional ones.

In schema-focused therapy it is important to detect, measure and modify the EMSs. In order to measure EMS activity first Young (1990) and then Young and Brown (1994) (YSQ-Long Form) developed the Young Schema Questionnaire, which originally included 15 and 16 EMS subscales and 123 and 205 items, respectively. Exploratory factor analysis (EFA) of a clinical patient sample supported 15 EMSs (Schmidt, Joiner, Young, & Telch, 1995); the social undesirability EMS was excluded and the emotional inhibition EMS was modified. The validity of the construct has been confirmed by Lee, Taylor, and Dunn (1999). In 1998, Young (1998) developed a less unwieldy measure, the Young Schema Questionnaire Short Form (YSQ-S), which consisted of 15 EMSs and 75 items extracted from the highest loading items in the YSQ-L. YSQ-S and YSQ-S2 differ minimally in one item (YSQ-S2, item #56; one extra sentence in

**Table 1**

Five schema domains and 18 early maladaptive schemas (Young et al., 2003)

Schema domains	Early maladaptive schemas	Abbreviation
<i>Disconnection &amp; rejection</i>	Emotional deprivation	ED
	Abandonment/instability	AB
	Mistrust/abuse	MA
	Social isolation/alienation	SI
	Defectiveness/shame	DS
<i>Impaired autonomy &amp; performance</i>	Failure	FA
	Dependence/incompetence	DI
	Vulnerability to harm or illness	VH
	Enmeshment/undeveloped self	EM
<i>Impaired limits</i>	Entitlement/grandiosity	ET
	Insufficient self-control/self-discipline	IS
<i>Other-directedness</i>	Subjugation	SB
	Self-sacrifice	SS
	Approval-seeking/recognition-seeking	AS
<i>Overvigilance &amp; inhibition</i>	Negativity/pessimism	NP
	Emotional inhibition	EI
	Unrelenting standards/hypercriticalness	US
	Punitiveness	PU

parentheses: “showing I care”) and can be considered equal. Several studies thereafter have analysed the psychometric properties of that scale. The 15-factor structure was replicated in two studies (Waller, Meyer, & Ohanian 2001; Welburn, Coristine, Dagg, Pontefract, & Jordan, 2002). Theoretical development and EFA analyses have also revealed three (Schmidt et al., 1995), four (Lee, Taylor, & Dunn, 1999) and six (Young, 1990) higher order factors – schema domains – which represent important parts of the unmet core needs of the child. Confirmatory factor analyses (CFA) for the YSQ-S (15 EMSs; Baranoff, Oei, Cho, & Kwon, 2006) and YSQ-L (16 EMSs; Rijkeboer & Bergh, 2006) have supported both 13 and 16 factor structures. The latest YSQ-L3a (18 EMSs and 232 items) schema questionnaire (Young & Brown, 2003) was developed to measure all the 18 EMSs (Young, 1999; Young et al., 2003). However, the 18-EMS structure has not yet been confirmed in any studies.

The importance of early traumatic experiences and emotional disturbances in the later development and maintenance of chronic pain and pain disability has been a topic of much interest during the last two decades, more so, when neuroimaging has shown changes in many emotionally important sites of central nervous system among chronic pain patients (Apkarian et al., 2004; Goldberg, Pachas, & Keith, 1999; Rome & Rome, 2000; Schofferman, Anderson, Hines, Smith, & Keane, 1993). In addition to major depression and anxiety, almost 50% of the chronic pain patients were shown to suffer from personality disorders (Monti, Herring, Schwartzman, & Marchese, 1998). To the best of our knowledge, no studies have been conducted to measure the 18-EMS latent factor structure according to the latest development of schema-focused therapy (Young et al., 2003). The main aim of the present study was to confirm the structural model of the Young Schema Questionnaire (short form) with all 18 schemas in the Finnish language version in medically ill patients and a control group.

## 2. Method

### 2.1. Participants

Consecutive 18–64 year old first visit pain patients were recruited for this study from six pain clinics in central middle and northern Finland during a period of 1 year (January 2004–2005). Patients having a primary psychotic disorder, a cognitive impairment or an inability to complete questionnaires were excluded from the study. Sources of referral included primary health care and various medical specialists. The patients were informed in advance about the study protocol by letter. Every patient attending the pain clinic got the questionnaire by which the data was gathered. A clinical nurse provided assistance if a patient had problems in completing the questionnaire. Of 318 eligible patients, 271 participated. All these patients were suffering from non-malignant, daily, chronic pain lasting 3 months or longer. The typical pain diagnoses were sciatica, arthrosis and neuropathic pain. No specific Axis I or II diagnoses were made.

The control group was recruited from employees of Raahe town administration ( $n = 918$ ; women  $n = 728$ ; men  $n = 190$ ). In attempting to match the groups the inclusion criterion in the control group was age 18–65 years. All the municipal officials were informed beforehand by electronic weekly bulletin that a control group for a chronic pain study was needed and everyone would receive a questionnaire to complete within 1 month (March 2005). They were also informed that the study was based on total anonymity and free will. A total of 331 individuals participated in the study.

The study protocol was approved by the ethical committee of the Northern Ostrobothnia Hospital District. A written informed consent was obtained from all participants.

#### 2.1.1. Demographic data

The pain patient group had a mean age of 47.0 years (SD 9.3 years; range 18–64 years) and consisted of 127 males (47%) and 144 females (53%). The mean age of the control group was 47.4 years (SD 9.5 years; range 19–62 years). This group consisted of 40 males (12.1%), 284 females (85.8%) and 7 (2.1%) with sex not reported. The mean duration of education was 11.4 years (SD 1.7 years; range 9–18 years) in the pain patient group and 13.2 years (SD 2.9 years; range 10–18 years) in the control group. The duration of education was estimated from the occupation. The pain and control groups were found to be comparable in age. However, the groups did differ in their gender distribution ( $\chi^2 = 87.1$ ;  $p < 0.001$ ) and in duration of education significantly ( $t = 10.6$ ;  $p < 0.001$ ; Table 2).

**Table 2**

Demographic, total EMS mean and individual EMS items' skewness and kurtosis data on the pain patient and control sample

Variable	Chronic pain patients			Control group			Sig.
	Mean	SD	Range	Mean	SD	Range	
Age	47.0	9.3	18–64	47.4	9.5	19–62	ns.
Male/female/not reported			127/144			40/284/7	<0.001*
Duration of education	11.4	1.7	9–18	13.2	2.9	10–18	<0.001‡
Sample size (= n)			271			331	
EMS mean	2.00	0.70	1–4.7	1.85	0.49	1–3.8	<0.05‡
Skewness, individual EMS items	1.69		–0.12–+4.31	1.71		–0.07–+4.19	
Kurtosis, individual EMS items	3.47		–1.20–+20.4	4.33		–0.93–+23.5	

Note: \* = Chi-square.

‡Student's *t*-test.

ns. = non significant.

## 2.2. Measures

### 2.2.1. Early maladaptive schemas

Both groups completed the Finnish version of the extended Young Schema Questionnaire – short form (= YSQ-S2-extended). YSQ-S2 is a 75-item self-report, Likert-type questionnaire (Young & Brown, 2003), where a value of 1 means “Completely untrue of me” and a value of 6 means “Describes me perfectly”. Higher values describe stronger schema valence and a more maladaptive core belief. The questionnaire is designed to assess 15 early maladaptive schemas (EMS) and to provide a total score reflecting the level of each EMS. The 15 subscales are as follows: emotional deprivation = ED, abandonment/instability = AB, mistrust/abuse = MA, defectiveness/shame = DS, social isolation/alienation = SI, dependence/incompetence = DI, vulnerability to harm or illness = VH, enmeshment/undeveloped self = EM, failure = FA, entitlement/grandiosity = ET, insufficient self-control/self-discipline = IS, subjugation = SB, self-sacrifice = SS, emotional inhibition = EI, unrelenting standards/hypercriticalness = US. The construct validity (Welburn et al., 2002) and reliability of the questionnaire in clinical and research use (Waller et al., 2001) have been established. When our data collection started the theoretical development of schema-focused therapy was proposed to be composed of 18 EMSs but there was no short version of the YSQ available including all the 18-EMS subscales (the 15 EMSs already mentioned and approval-seeking/recognition-seeking = AS, negativity/pessimism = NP, punitiveness = PU; Young et al., 2003). We therefore made a pilot study with a different pain patient sample who completed all the AS, NP and PU EMS items from the YSQ-L3a (Young & Brown, 2003) Finnish version. We calculated the mean of every item and included in the YSQ-S2-extended the five highest valued items from every subscale, which were the following (in parentheses there is the reference of seven EMS items which are included in the YSQ-S3; Young, 2005):

“It is important to me to be liked by almost everyone I know” (AS76)

“Accomplishments are most valuable to me if other people notice them” (AS77) (YSQ-S3-item #34)

“I find it hard to set my own goals, without taking into account how others will respond to my choices” (AS78)

“When I look at my life decisions, I see that I made most of them with other people's approval in mind” (AS79)

“Lots of praise and compliments make me feel like a worthwhile person” (AS80) (YSQ-S3-item #88)

“Even when things seem to be going well, I feel that it is only temporary” (NP81) (YSQ-S3-item #17)

“If something good happens, I worry that something bad is likely to follow” (NP82) (YSQ-S3-item #35)

“You can't be too careful; something will almost always go wrong” (NP83) (YSQ-S3-item #53)

“I focus more on the negative aspects of life and of events than on the positive” (NP84)

“People close to me consider me a worrier” (NP85)

- “If I don’t try my hardest, I should expect to lose out” (PU86) (YSQ-S3-item #36)  
 “There is no excuse if I make a mistake” (PU87)  
 “People who don’t “pull their own weight” should get punished in some way” (PU88)  
 “If I don’t do the job, I should suffer the consequences” (PU89) (YSQ-S3-item #54)  
 “I often think about mistakes I’ve made and feel angry with myself” (PU90)

The original English version of the YSQ-S2 has been in clinical use in Finland for several years and the 15 aforementioned additional items (AS, NP, PU) were translated into Finnish by a group of counsellors and the whole questionnaire was back-translated blind into English by another bilingual group. An authorised translator checked the original and back-translated version. A group of counsellors then assessed both the syntax and the cultural interpretations of each item. The original items appeared in the same order as in the YSQ-S2. The abbreviation YSQ-S2-extended refers in this text to this Finnish version with 18-EMSs and 90 schema items.

### 2.3. Procedure and data analysis

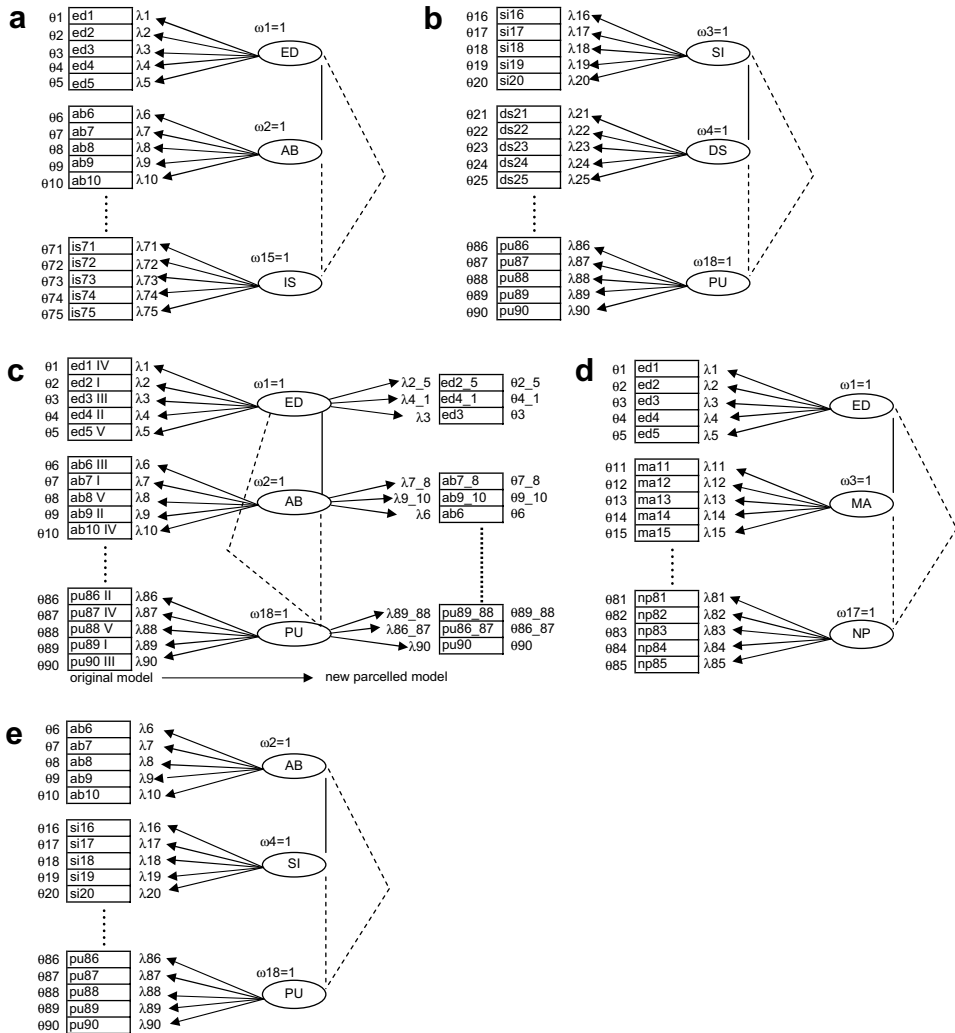
#### 2.3.1. Reliability and EMS distribution characteristics

The reliability of the YSQ-S2-extended was estimated in both samples by computing Cronbach’s alphas for individual EMS subscales. The lowest acceptable alpha value can be regarded as 0.70. The total EMS mean differed little but significantly ( $p < 0.05$ ) between the groups and the data of individual EMS subscales was moderately skewed and kurtotic in both groups (Table 2). The scale reliability estimations and distribution analyses were made with SPSS (version 12.0.1. for Windows).

#### 2.3.2. Factor modelling

The YSQ-S2-extended consisted of 90 items in 18-EMS subscales. As the confirmatory factor analysis (CFA) of the model with such a large amount of items and latent factors was very complex, we had to make the CFA in several steps to confirm the model as follows (Leskinen, 1987):

- (1) We first analysed the original YSQ-S2 (75 items in 15-EMS subscales) as such for all participants to see how the hypothetical latent structure of YSQ-S2 would appear, how the 75 individual schema items would load ( $\lambda_{1-75}$ ) and how the residuals ( $\theta_{1-75}$ ) would appear. The variances of each latent EMS factors ( $\omega_{1-15}$ ) were fixed to the value of one (Fig. 1a).
- (2) We then arbitrarily excluded the first three schema subscales from the YSQ-S2-extended, namely ED, AB and MA, and included the AS, NP and PU subscales to be analysed in the same way the last 15 EMSs and their 75 individual schema items to obtain their loadings ( $\lambda_{16-90}$ ) and residuals ( $\theta_{16-90}$ ) to see how the “new” AS, NP and PU EMSs would converge in the model. The variances of each latent EMS factor ( $\omega_{3-18}$ ) were fixed to the value of one (Fig. 1b). This selection also made it possible to compare the individual subscale item loadings in 12 shared EMSs from analyses #1 and #2.
- (3) In the third step, we checked separately all the five item loadings of each subscale from steps 1 and 2 for all 18 EMSs to put the loadings in the order of magnitude from I (= strongest) to V (= weakest). We then aggregated the I and V strongest loadings and the II and IV strongest loadings (the mean values of the original matrix of I–V and II–IV items were put in the original matrix) and left the third strongest item (= III) unchanged (Little, Cunningham, & Shahar, 2002). Thus, the new model consisted of two different parcel indicators and one single item indicator for each latent EMS factor (54 individual schema items and 18 latent EMS factors). The variances of each latent EMS factors ( $\omega_{1-18}$ ) were fixed to the value of one. In that way we could analyse the first order factor structure for the whole YSQ-S2-extended with 18 EMSs (Fig. 1c) in the total sample.
- (4) The 18 EMSs were divided arbitrarily into two separate parts to compare the model structure, individual item loadings and squared multiple correlations between the pain patient and control groups. The parts consisted of the odd EMSs (ED, MA, DS, DI, EM, SS, US, IS and NP) and the even EMSs (AB, SI, FA, VH, SB, EI, ET, AS and PU). In all the models, the variances of the latent EMS factors were accordingly fixed to one ( $\omega_{\text{odd } 1-17}$ ,  $\omega_{\text{even } 2-18}$ ), the loadings of each individual schema items were named and measured accordingly ( $\lambda_{\text{odd } 1-85}$  and  $\lambda_{\text{even } 6-90}$ ) as were the residuals ( $\theta_{\text{odd } 1-85}$  and  $\theta_{\text{even } 6-90}$ ) (Fig. 1d and e).



**Fig. 1.** a) Model #1, YSQ-S2 = the first 15 EMSs-all participants. b) Model #2, The last 15 EMSs-all participants. c) Model #3, The parcelled model of all the 18 EMSs-all participants. d) Model #4, The odd EMSs-pain vs. control sample. e) Model #4, The even EMSs-pain vs. control sample.  $\theta$  = error variance,  $\lambda$  = factor loading,  $\omega$  = factor variance, ed = Emotional Deprivation, ab = Abandonment/Instability, ma = Mistrust / Abuse, si = Social Isolation/ Alienation, ds = Defectiveness/ Shame, is = Insufficient Self-Control/ Self-Discipline, np = Negativity/ Pessimism, pu = Punitiveness. Note: The Roman numerals I–V in the Model #3 refer to the item loadings (I = strongest; V = weakest value).

We used the diagonally weighted least squares estimation method (DWLS) and polychoric correlation matrix as the individual schema items were discrete, ordinal variables and in most cases the distribution was positively skewed. The polychoric correlation matrix was calculated with Prelis 2.80 and the confirmatory factor analysis was conducted with Lisrel 8.80.

### 2.3.3. Fit indices

As the models were relatively complex, we used several different fit indices to assess their goodness-of-fit. In situations where the number of cases is high the  $\chi^2$  test is unreasonable. According to Mueller (1996)  $\chi^2$  was compared to the degrees of freedom and a rule of thumb for a good criterion of fit is  $\chi^2/df \leq 2$ . Root Mean Square Error of Approximation ( $RMSEA \leq 0.05$ ; Browne & Cudeck, 1993),



Goodness-of-Fit Index ( $GFI \geq 0.95$ ), Adjusted Goodness-of-Fit Index ( $AGFI \geq 0.90$ ), Standardized Root Mean Square Residual ( $SRMR \leq 0.05$ ; Jöreskog & Sörbom, 1988) and Normed Fit Index ( $NFI \geq 0.95$ ; Bentler & Bonnet, 1980) were used as indices for a good fit of the model.

### 3. Results

#### 3.1. Reliability of the YSQ-S2-extended

The alphas for the individual EMS subscales varied between 0.94 and 0.79 in the pain patient group and between 0.94 and 0.81 in the control group (Table 3). In all cases these alpha levels were well above 0.70.

#### 3.2. Confirmatory factor analysis of YSQ-S2-extended

The results of the various CFAs are shown in Table 4. The  $\chi^2/df$ , RMSEA, NFI, GFI and AGFI values indicated a good fit and SRMR acceptable fit to models #1, #2, and #4. All the fit indices indicated a good fit to model #3, which had the 18-EMS factor structure with two parcelled item indicators and one single item indicator for each EMS subscale (Table 4). The fit statistics of the pain and control groups were found in comparison to be close to each other. The correlations between different factors in models #1 and #3 are shown in Table 5 and 6, respectively.

#### 3.3. Individual item loadings in YSQ-S2-extended

The individual factor loadings were taken from analysis #4 and varied in the pain group between 0.97 and 0.51 and in the control group between 0.97 and 0.57 (Table 3). The  $t$ -test values of all individual loadings were significant. The squared multiple correlations ( $R^2$ ) had values over 0.30 in all items except item AS #80 in the pain patient group (Table 3). The error variances of the items varied accordingly 0.05–0.74 in the pain group and 0.05–0.67 in the control group.

**Table 3**

Cronbach's alphas ( $\alpha$ ), mean and median (Med) EMS values, individual schema item loading range ( $\Delta$  range) and squared multiple correlations range ( $R^2$ ) in pain and control groups

Early maladaptive schema (EMS)	Pain group					Control group				
	$\alpha$	Mean	Med	$\Delta$ range	$R^2$ range	$\alpha$	Mean	Med	$\Delta$ range	$R^2$ range
Emotional deprivation	0.92	1.97	1.6	0.94–0.78	0.89–0.61	0.91	1.66	1.4	0.94–0.73	0.88–0.53
Abandonment/instability	0.91	1.83	1.4	0.94–0.84	0.87–0.71	0.84	1.69	1.4	0.87–0.72	0.76–0.52
Mistrust/abuse	0.89	1.67	1.4	0.89–0.78	0.80–0.60	0.83	1.59	1.4	0.94–0.60	0.88–0.36
Social isolation/alienation	0.94	1.87	1.4	0.96–0.87	0.91–0.76	0.88	1.60	1.4	0.93–0.70	0.86–0.49
Defectiveness/shame	0.94	1.56	1.0	0.96–0.90	0.93–0.81	0.94	1.41	1.0	0.96–0.93	0.93–0.86
Failure	0.94	1.79	1.4	0.97–0.88	0.94–0.78	0.93	1.66	1.4	0.96–0.88	0.92–0.78
Dependence/incompetence	0.86	1.58	1.2	0.95–0.83	0.83–0.69	0.85	1.26	1.0	0.90–0.82	0.81–0.67
Vulnerability to harm or illness	0.87	1.77	1.4	0.89–0.78	0.79–0.61	0.86	1.49	1.2	0.93–0.81	0.86–0.66
Enmeshment/undeveloped self	0.84	1.34	1.0	0.92–0.80	0.85–0.65	0.85	1.26	1.0	0.93–0.78	0.86–0.61
Subjugation	0.89	1.48	1.2	0.96–0.84	0.93–0.71	0.85	1.41	1.2	0.90–0.73	0.82–0.53
Self-sacrifice	0.83	3.36	3.2	0.87–0.65	0.76–0.42	0.84	3.20	3.2	0.85–0.68	0.73–0.41
Emotional inhibition	0.88	1.89	1.6	0.98–0.74	0.95–0.54	0.91	1.77	1.6	0.90–0.84	0.81–0.71
Unrelenting standards/hypercriticalness	0.83	2.84	2.8	0.92–0.67	0.85–0.45	0.85	2.87	2.8	0.92–0.72	0.84–0.51
Entitlement/grandiosity	0.81	1.68	1.4	0.95–0.64	0.90–0.41	0.82	1.57	1.4	0.85–0.68	0.78–0.47
Insufficient self-control/self-discipline	0.89	1.88	1.6	0.88–0.80	0.77–0.64	0.84	1.72	1.6	0.88–0.69	0.78–0.48
Approval-seeking/recognition-seeking	0.79	2.64	2.6	0.97–0.51	0.94–0.26	0.84	2.80	2.8	0.94–0.57	0.88–0.33
Negativity/pessimism	0.86	2.34	2.2	0.88–0.67	0.77–0.45	0.89	2.04	1.8	0.90–0.81	0.81–0.66
Punitiveness	0.81	2.28	2.0	0.91–0.65	0.84–0.43	0.81	2.18	2.0	0.97–0.66	0.95–0.44

**Table 4**

Results of the various confirmatory factor analyses in Fig. 1a–e

Early maladaptive schemas in the model	Model	Group	$\chi^2$	df	$\chi^2/df$	RMSEA	NFI	SRMR	GFI	AGFI
YSQ-S2 = 15 first EMSs (all except AS, NP, PU)	#1	All	3942	2595	1.52	0.033	0.99	0.052	0.99	0.99
15 last EMSs (all except ED, AB, MA)	#2	All	4361	2595	1.68	0.038	0.98	0.057	0.98	0.98
YSQ-S2-extended = 18 EMSs (parcelled model)	#3	All	1661	1224	1.34	0.028	0.99	0.037	1.00	0.99
9 odd EMSs (ED, MA, DS, DI, EM, SS, US, IS, NP)	#4 (odd)	Pain group	1217	909	1.34	0.040	0.97	0.070	0.98	0.98
	#4 (odd)	Control group	1255	909	1.38	0.036	0.98	0.067	0.98	0.98
9 even EMSs (AB, SI, FA, VH, SB, EI, ET, AS, PU)	#4 (even)	Pain group	1315	909	1.45	0.044	0.98	0.062	0.99	0.99
	#4 (even)	Control group	1401	909	1.54	0.043	0.97	0.061	0.98	0.98

Note: Emotional deprivation = ED, abandonment/instability = AB, mistrust/abuse = MA, social isolation/alienation = SI, defectiveness/shame = DS, failure = FA, dependence/incompetence = DI, vulnerability to harm or illness = VH, enmeshment/undeveloped self = EM, subjugation = SB, self-sacrifice = SS, emotional inhibition = EI, unrelenting standards/hypercriticalness = US, entitlement/grandiosity = ET, insufficient self-control/self-discipline = IS, approval-seeking/recognition-seeking = AS, negativity/pessimism = NP and punitiveness = PU.

### 3.4. Repeatability of the estimation method

As models #1 and #2 consisted of 12 shared EMS subscales, we had an opportunity to compare the repeatability of the estimation method by comparing the individual item loadings. They appeared to have values with an average limit of 0.01 between separate models. The order of magnitude of the loadings was the same in nine out of 12 subscales, and in the remaining three only values II and III or III and IV had changed order if their loadings were very near each other.

## 4. Discussion

In this study, we confirmed the latent structure of 18 EMSs in the Finnish language version of the YSQ-S2-extended (the original YSQ-S2 and AS, NP and PU EMSs). Another important finding was the appropriateness of the scale with chronic pain patients. The individual schema loadings and squared multiple correlations proved to be sufficient.

The original YSQ-S2 with 15 EMSs and 75 schema items gave good fit indices in all but one measure (SRMR), confirming the model. The parcelled model with all the 18 latent EMS factors gave the best indices. It also had statistically the best sample to item ratio. Parcelling has its advantages and drawbacks. The first area of concern surrounds the dimensionality of a construct and the potential pitfalls of a misspecified factor model. Parcelling should be considered under conditions of

**Table 5**

Correlation matrix of 15 latent EMSs from model #1 (YSQ-S2) in Fig. 1a

Correlation matrix of independent variables															
	ED	AB	MA	SI	DS	FA	DI	VH	EI	SS	EM	SB	IS	US	ET
ED	1.00														
AB	0.64	1.00													
MA	0.62	0.67	1.00												
SI	0.80	0.63	0.74	1.00											
DS	0.73	0.68	0.65	0.77	1.00										
FA	0.58	0.55	0.53	0.65	0.76	1.00									
DI	0.64	0.66	0.63	0.72	0.79	0.74	1.00								
VH	0.52	0.65	0.65	0.64	0.64	0.61	0.75	1.00							
EI	0.61	0.48	0.55	0.66	0.65	0.52	0.60	0.55	1.00						
SS	0.19	0.27	0.23	0.21	0.18	0.09	0.09	0.19	0.16	1.00					
EM	0.58	0.60	0.57	0.65	0.65	0.63	0.71	0.66	0.52	0.14	1.00				
SB	0.68	0.65	0.66	0.77	0.79	0.71	0.79	0.69	0.66	0.19	0.74	1.00			
IS	0.50	0.56	0.61	0.62	0.66	0.62	0.72	0.62	0.56	0.18	0.56	0.69	1.00		
US	0.31	0.35	0.48	0.43	0.30	0.21	0.29	0.36	0.35	0.39	0.27	0.33	0.42	1.00	
ET	0.46	0.62	0.59	0.62	0.57	0.49	0.61	0.61	0.57	0.29	0.56	0.57	0.70	0.56	1.00

**Table 6**

Correlation matrix of all 18 latent EMSs from model #3 in Fig. 1c

	ED	AB	MA	SI	DS	FA	DI	VH	EM	PU	NP	AS	IS	SB	SS	EI	US	ET
ED	1.00																	
AB	0.65	1.00																
MA	0.65	0.70	1.00															
SI	0.79	0.63	0.77	1.00														
DS	0.74	0.69	0.68	0.76	1.00													
FA	0.58	0.56	0.52	0.62	0.74	1.00												
DI	0.63	0.67	0.64	0.71	0.79	0.74	1.00											
VH	0.51	0.66	0.69	0.64	0.65	0.64	0.77	1.00										
EM	0.58	0.59	0.60	0.65	0.64	0.65	0.70	0.67	1.00									
PU	0.47	0.54	0.61	0.59	0.57	0.52	0.57	0.60	0.47	1.00								
NP	0.58	0.63	0.69	0.66	0.62	0.62	0.68	0.77	0.58	0.77	1.00							
AS	0.30	0.45	0.48	0.34	0.43	0.39	0.42	0.49	0.35	0.65	0.60	1.00						
IS	0.49	0.58	0.64	0.61	0.64	0.60	0.68	0.63	0.56	0.63	0.64	0.57	1.00					
SB	0.68	0.65	0.70	0.75	0.79	0.71	0.77	0.70	0.73	0.57	0.66	0.43	0.67	1.00				
SS	0.18	0.27	0.26	0.21	0.19	0.09	0.10	0.21	0.18	0.36	0.26	0.44	0.17	0.20	1.00			
EI	0.59	0.47	0.57	0.62	0.63	0.51	0.57	0.55	0.53	0.52	0.58	0.41	0.52	0.66	0.16	1.00		
US	0.31	0.34	0.50	0.43	0.30	0.20	0.28	0.34	0.28	0.62	0.52	0.50	0.40	0.32	0.38	0.33	1.00	
ET	0.47	0.63	0.65	0.63	0.60	0.49	0.60	0.62	0.55	0.68	0.57	0.55	0.71	0.56	0.29	0.57	0.60	1.00

unidimensionality. That is what the individual EMS subscale schema items are based on. According to the schema theory we have combined only unidimensional items. Parcelling may increase Type II error rate by reducing the ability to identify misspecified models. However, parcelling also has many psychometrically grounded advantages. When using skewed and kurtotic data, parcelling reduces the violations to distribution. When using ordinal and discrete data, scales move from ordinal towards more continuous scales, as scale intervals increase in number. The models are more parsimonious, having fewer estimated parameters, all of these increasing the psychometric merits. Just-identified models increase stability (Little et al., 2002). Parcelling was the only way to test the large 18-EMS model. Although Rijkeboer and Bergh (2006) also used parcelled models, the statistics of that study could not be compared because of a different estimation method (Maximum Likelihood = ML) and item (2\*97) and EMS (16) number. The statistics ( $\chi^2/\text{df}$  and RMSEA) of their best model (tau-equivalent) are parallel with our study. Baranoff et al. (2006) used CFA in their Korean and Australian samples, but again the ML-method and different factor structure (13 and 15) did not allow us to compare the models fully. However, their 75-item 15-EMS model gave quite comparable  $\chi^2/\text{df}$  fit indices and a little more unsatisfactory RMSEA and SRMR indices than in our model #1. Most of all, these studies and ours confirmed the 15-, 16- and 18-EMS factor structure of YSQ in different languages, namely Dutch, Korean (Hanguk Mal), English and Finnish.

The selection of odd and even EMSs for the pain and control group comparison was based on two facts: (1) the 18-EMS model had too small sample size for an analysis of two separate groups and (2) we wanted to include in the models the earliest and latest schemas according to the schema theory (Young et al., 2003). The goodness-of-fit indices did not differ between the two groups and in all cases they showed good model fit except in SRMR, which showed an acceptable fit. Individual item loadings proved to be over 0.50 in both groups. The squared multiple correlations (except AS #80 on the pain sample) had acceptable values, indicating good measuring quality of the individual schema items. The reliability of the scale measured by internal consistency was adequate to high in both samples.

Statistically, the data of YSQ is cumbersome. The ML and GLS estimation approaches rely on the assumption of multivariate normality and continuous data (Muthén, 1984). However, in practice, these assumptions are often violated in different kinds of questionnaire data (Hu, Bentler, & Kano, 1992). As the items of YSQ have values which are discrete, ordinal and usually positively skewed in normal population, the data violate the assumptions of ML or GLS estimations (Lee, Song, Skevington, & Hao, 2005). In the case of ordinal data the polychoric correlation matrix is recommended (Jöreskog, 1990; Jöreskog & Sörbom, 1981; Olsson, 1979). According to Quiroga (1992) and Flora and Curran (2004) in even moderately skewed and kurtotic data the polychoric estimate was only less than 4% overbiased.

Regarding our data the polychoric correlation estimation we used was, respectively, reliable and a little overbiased. Flora and Curran (2004) and Wang and Cunningham (2005) suggest that the method of choice for analysing ordinal, nonnormal data is diagonally weighted least squares estimation (DWLS), which uses the polychoric correlation matrix and is reported to be quite a stable and reliable method even in smaller samples when compared to the WLS (weighted least squares) method. The chi-square statistics are a little inflated leading to type I error. The increasing number of indicators in the model leads to overestimation of parameters in WLS but there is no such effect of model size on parameter estimation with DWLS. Parameter estimates (both factor loadings and factor correlations) seem to be affected by non-normality, but the effect is small. The estimates are positively biased, but by less than 5% in our material, according to Flora and Curran (2004). The standard errors are usually slightly negatively biased. We therefore assume that the parameter estimations in our analysis can be kept reliable as the kurtosis and skewness were within the limits described by Quiroga (1992) and Flora and Curran (2004) and the sample size was large. The method, however, is prone to type I error, but slightly. The DWLS estimation method used in our study gave stable item loadings in two separate models, which had 12 shared EMS subscales and 60 shared items. The method with this data also gave no error warnings.

This study had several limitations. Unfortunately, it was not possible to conduct an ordinary psychiatric interview because the sample was gathered from several pain clinics by many different physicians not specialised in psychiatry. As the model is fairly complex the statistical power would have been better if the sample size had been even bigger. The control group also differed in gender distribution and education level from the pain patient sample. However, Rijkeboer, Bergh, and Bout (2005) found no bias or corresponding tendency in different gender or education level. The items of every subscale were grouped together in the YSQ-S2-extended version used. This may well have biased the answering tendency in respondents and increased the model fitness compared to the study by Rijkeboer and Bergh (2006). However, it was in the original order of the YSQ-S2 (Young & Brown, 2003) and ready for clinical assessment for individual patients in an outpatient set. In populations with somatic symptoms, like chronic pain, activation of a single psychological issue may be difficult or prohibited. A grouping of a single concept or proposition can serve to bring to consciousness many other concepts or propositions to which it is closely related (Segal, Williams, Teasdale, & Gemar, 1996). Thus, the grouping can better activate the psychological inspection of different issues of the pain patients. While the manuscript of this article was being written, a new version of YSQ-S was published, namely YSQ-S3 (Young, 2005), which has 90 items in 18 EMS and in which the items are no longer grouped in subscales. The names of some EMSs had changed a little, but the schema item content had changed only marginally from the YSQ-S2, namely there were some stylistic changes in some of them. Seven of the fifteen schema items from AS, NP and PU EMSs, which we added, are the same and the remaining eight have the same thematic content. The punitiveness (PU) EMS, however, had been changed to a more personal/individual self-punitiveness EMS with two items the same as in this study. Such changes may well cause some confusion in the study of EMSs.

To the best of our knowledge this was a YSQ validation study with the oldest sample also using a control group from normal life circumstances (vs. psychology undergraduates in most earlier studies). This was also the first study where individual item loadings of YSQ could be measured. The results demonstrated that the latent factor structure proposed by Young et al. (2003) could also be revealed with the Finnish version of the scale and in patients with somatic symptoms. The 18-EMS factor structure was confirmed.

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## Clinical pain research

## Early maladaptive schemas in Finnish adult chronic male and female pain patients

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## ABSTRACT

**Background and aims of the study:** The connection between chronic pain and traumatic experiences in childhood has been established in several studies. The association of emotional maltreatment with chronic pain has been studied, but to a lesser degree. Schema therapy [24] is an extension of cognitive therapy and presents the early maladaptive schema (EMS) concept. EMSs reflect early, mainly emotional maltreatment. The aim of the present study was to examine the existence of EMSs, the association between EMSs and pain variables and EMS driven patterns.

**Patients and measures:** The study consisted of 271 first visit pain patients. Their socio-demographic data, pain variables and pain disability were assessed. The presence of EMSs was measured using the Young Schema Questionnaire Short Form Extended. One hundred and three successive participants were also interviewed according to the cognitive case conceptualization.

**Results:** More than half (58.3%) of the chronic pain patients scored EMSs as meaningful. The patients with meaningful EMSs had significantly higher pain intensity, duration of pain and pain disability. The two most frequently occurring EMSs in male pain patients were Unrelenting Standards/Hypercriticalness (US) (36.2%) and Self-Sacrifice (SS) (23.6%) and in female pain patients SS (40.3%) and US (27.1%). The speech contents of five of the highest scoring US and SS male and female patients ( $n=20$ ) were analyzed. The analyses showed schema driven behavior which exacerbated the pain situation. US and SS schemas had a stronger motivational effect on their behavior than the pain itself. Regression analyses showed that Self-Sacrifice schema in women and Emotional Deprivation schema in the total sample predicted pain disability as did pain intensity and the number of pain locations.

**Conclusions:** This study suggested that a remarkable amount of chronic pain patients may suffer from early maladaptive schemas which have an effect on their current pain situation and may reflect underlying early emotional maltreatment.

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## 1. Introduction

The reporting of abusive or neglectful childhood experiences is associated with an increased risk of experiencing chronic pain in adulthood [1]. Physical and sexual abuse in childhood are connected with non-specific chronic pain and pelvic pain [2,3]. Both physical/sexual, psychological and social adversities of childhood have been linked to different kinds of pain, e.g. low-back pain, fibromyalgia, prostatic/pelvic pain and somatoform pain disorder [4–9]. The association of chronic pain and emotional maltreatment alone has been less studied. However, emotional abuse and neglect have been shown to be associated with fibromyalgia [10,11].

Pain disability, related to restrictions and limitations in daily living, is associated with or predicted by numerous factors such as age [12], male gender [13], pain severity [14,15], pain distribution [15] and psycho-social factors [14,16]. Pain and disability are also associated with psychological factors like distress [17], fear avoidance [18], self-efficacy [19,20], motivational stages of chronic pain management [21] and depression (e.g. [12,22]).

Young [23] introduced his early maladaptive schema (EMS) concept as an extension of cognitive therapy. According to the schema theory [23,24] early childhood experiences lay the foundations for an individual's patterns and models of the self, others and the world. Young hypothesizes that in adverse life situations these patterns become maladaptive, i.e. dysfunctional, pervasive and causing suffering. EMSs reflect underlying psychic themes representing important core needs of the child. There are now 18 different EMSs grouped into 5 schema domains [24]. The domains represent (1) needs for safety, nurture, empathy and security; (2) expectations about oneself and environment with one's ability to separate, function and survive; (3) limits; (4) an excessive focus on the desires and needs of others at the expense of personal needs; (5) an excessive emphasis on suppressing one's spontaneous feelings, impulses and choices, and meeting rigid, internalized rules [25]. Some EMSs like Unrelenting Standards/Hypercriticalness and Self-Sacrifice are conditional and can cover earlier developed, unconditional EMSs like Emotional Deprivation. Because of their early origin, the individual regards EMSs as a familiar and the best and most reliable way to construe and manage different life situations [24,26]. Many EMSs reflect purely early emotional maltreatment, such as neglect, abandonment and betrayal.

The aim of the study was to examine the presence of early maladaptive schemas and schema driven behavior in a chronic pain patient sample and to investigate the relationship between these schemas and different pain variables. We also wanted to explore if EMSs predict pain or pain disability.

## 2. Methods

### 2.1. Participants and procedure

Participants were recruited from 6 pain clinics in central and northern Finland during a period of one year (January 2004–2005), and were consecutive 18–64-year-old first-time patients. Sources of referral included primary health care and various medical specialists. Patients having a psychotic disorder, a cognitive impairment or inability to complete questionnaires were excluded from the study. The total sample consisted of 318 patients, of whom fifteen percent ( $n=47$ ) declined to take part. All patients were suffering from non-malignant, daily, chronic pain lasting 6 months or longer ( $n=254$ ; 94%) or more than what is expected as normal recovery time after an injury or disease ( $n=17$ ; 6%). The mean age of the sample was 47.0 years ( $SD=9.3$  years; range 18–64 years) and included 127 males (47%) and 144 females (53%). The mean length of total education was 11.1 years ( $SD=1.6$  years; range 9–18 years)

and was estimated from the occupation. Men and women did not differ in age or education. All participants were Caucasians. Data was collected by questionnaires sent to every patient attending the pain clinic for the first time. The clinic nurse provided assistance if a patient had problems in completing the questionnaire.

One hundred and three of the aforementioned participants were semi-structurally interviewed according to the cognitive case formulation in one pain clinic: all their pain and other symptoms, thoughts about their pain disease, self, others, the world and the future, emotions concerning their pain and life situation and changes in their behavior concerning work, hobbies and social relations were elicited, tape-recorded and transcribed.

The patients were informed by letter about the study protocol and written consent was obtained. The study protocol was approved by the ethical committee of the Hospital District of North-eastern Ostrobothnia.

### 2.2. Measures

#### 2.2.1. Pain variables

The pain questionnaire was developed for this study to collect information on patients' socio-demographic data (age, occupation, gender), pain localization (body map), the onset of the pain disease, the temporal quality of the pain and the current pain intensity measured with two 10-cm Visual Analogue Scales (VAS). On the first VAS (pain max) patients were asked to rate their current maximal experienced pain (0 = "no pain" to 10 = "the worst pain one can imagine") and on the second VAS (pain min) their current minimal experienced pain (0 = "no pain" to 10 = "the worst pain one can imagine"). Pain intensity was the mean of those two visual analogue scales. The Pain Disability Scale (PDS) was developed for this study. It is a 9-item self-report scale consisting of 7 direct statements: "My pain is disturbing my sleep", "... my hobbies", "... my sex life", "... my work", "... my ability to move", "... my economy", "... my social contacts", and 2 inverted statements: "I can enjoy life despite my pain", "I can control my pain". All the items were self-reported on a Likert-type 0–3 scale: 0 = not at all; 1 = to some extent; 2 = significantly; 3 = very much. The total score (range 0–27) reflects the overall level of pain disability. The reliability of the PDS was 0.84 (Cronbach's alpha). Descriptive data on the pain variables is presented in Table 1. Typical pain diagnoses were sciatica, arthrosis, neuropathic and musculoskeletal pain.

#### 2.2.2. Early maladaptive schemas (EMS)

The patients completed the Finnish version of the Young Schema Questionnaire short form – extended (=YSQ-S2-extended, 18 EMSs, 90 schema items) [27]. This is a self-report, Likert-type questionnaire. Every EMS consists of five items, which can be rated from 1 (Completely untrue of me) to 6 (Describes me perfectly). If two or more of these five items are rated 5 or 6, the patient has a meaningful schema signifying that the schema exists and is of importance in the patient's life and has an effect on behavior [24]. The YSQ-S2-extended was designed to assess 18 EMSs, namely: Emotional Deprivation, ED; Abandonment/Instability, AB; Mistrust/Abuse, MA; Defectiveness/Shame, DS; Social Isolation/Alienation, SI; Dependence/Incompetence, DI; Vulnerability to Harm or Illness, VH; Enmeshment/Undeveloped Self, EM; Failure, FA; Entitlement/Grandiosity, ET; Insufficient Self-Control/Self-Discipline, IS; Subjugation, SB; Self-Sacrifice, SS; Emotional Inhibition, EI; Unrelenting Standards/Hypercriticalness, US; Approval-Seeking/Recognition-Seeking, AS; Negativity/Pessimism, NP; Punitiveness, PU. The reliability of the individual EMS subscales varied between 0.94 and 0.79 (Cronbach's alpha). The reliability and 18-factor structure of the YSQ-S2-extended in Finnish language has been established [27].

**Table 1**  
Pain variables in chronic male and female pain patients.

Pain variable	Men			Women			p
	127 <sup>a</sup>			144 <sup>a</sup>			
	Mean	SD	Range	Mean	SD	Range	
Duration of pain in years	9.9	9.4	0.5–36	8.8	8.3	0.3–35	ns.
Pain intensity, mean (VAS 0–10)	6.0	1.4	2.5–9.5	5.8	1.1	3–9	ns.
Pain disability scale (PDS; range 0–27)	17.4	4.9	5–27	15.6	5.1	3–26	.003 <sup>b</sup>
Pain sites in number	1.8	1.0	1–5	1.8	0.9	1–5	ns.
Face pain	8.7%			13.2%			ns.
Cervico-cranio-brachial pain with or without limb pain	44.9%			59.7%			.015 <sup>c</sup>
Low back pain with or without limb pain	71.7%			66.7%			ns.
Sole limb pain	18.1%			14.6%			ns.
Thoracic pain	12.6%			11.2%			ns.
Abdominal pain	22.8%			12.5%			.025 <sup>c</sup>

Note: Pain sites are shown as percentages of the total male and female sample. ns, non significant.

<sup>a</sup> Number.

<sup>b</sup> Student's *t*-test.

<sup>c</sup> Pearson's Chi-square.

### 2.3. Data analysis

#### 2.3.1. Quantitative analysis

The meaningful EMSs were sought according to Young [28] (see Section 2.2.2). Pearson's Chi-square was used in categorical variables and Student's *t*-test in normally distributed variables in group analyses between meaningful and non-meaningful EMS groups. To describe the schema distribution bar graphs were presented. The two most frequently occurring schemas in male and female chronic pain patients were sought. Linear regression analyses (enter method) were used to find out if age, duration of education and the most frequently occurring EMSs predicted pain intensity or if the aforementioned independent variables and pain characteristics predicted pain disability. As the kurtosis, skewness and histogram showed normal distribution of the dependent values and the residuals in the linear regression analyses also showed normal distribution, this method could be used. The word *predict* in this context refers to statistical association and not to real causality. Because the schema distribution differed in magnitude and order between men and women we conducted the analyses separately for both genders in the first two regression analyses. Standardized coefficients are shown so that the relative importance of all the

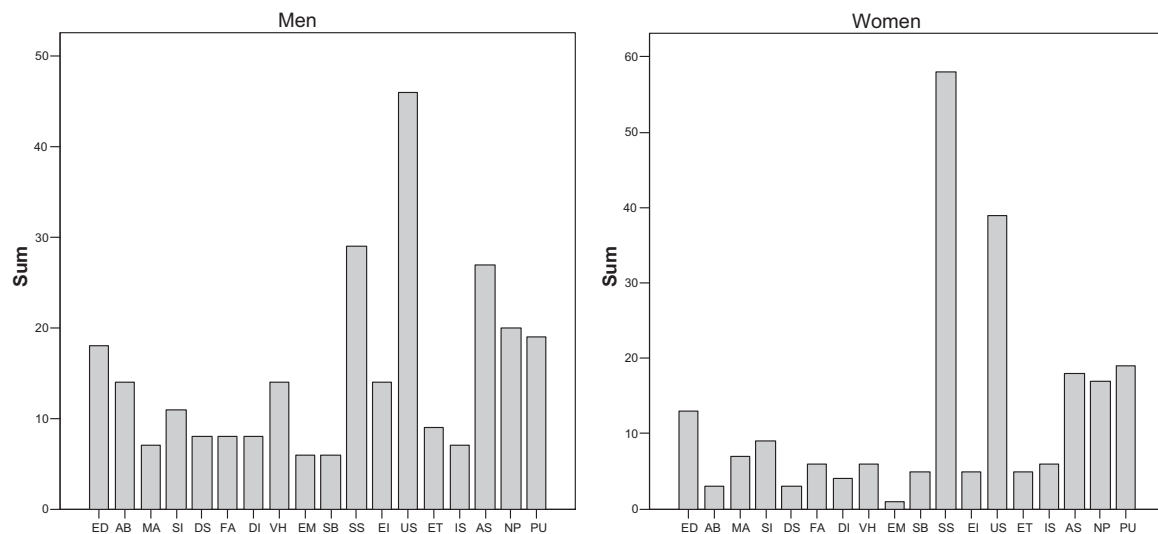
variables can be compared. The statistical analyses were conducted with SPSS (version 12.0.1. for Windows).

#### 2.3.2. Speech analysis

The tape-recorded and transcribed interviews were analyzed by two cognitive psychotherapists (A.S. and T.S.). The schemas and the schema driven behavior were expected to be found in the speech content where the patient was situated in a different position or relationship to one's self and disease, the health care system, work or other people. The schemas were identified according to their special features [24]. Special attention was paid to the schema driven behavior related to pain disease. For the assessment, both readers had to agree on the interpretation of the content of the speech.

### 3. Theory

We (A.S. and T.S.) have observed in clinical practice that female pain patients often display elements of self-sacrifice while male pain patients display elements of high standards in their speech and behavior. Theoretically, Young et al. [24] stated that Self-Sacrifice schema is common in psychosomatic disorders such as headache, gastrointestinal problems, chronic pain and fatigue. The



**Fig. 1.** Distribution of meaningful early maladaptive schemas in male and female chronic pain patients. Note: Emotional Deprivation, ED; Abandonment/Instability, AB; Mistrust/Abuse, MA; Social Isolation/Alienation, SI; Defectiveness/Shame, DS; Failure, FA; Dependence/Incompetence, DI; Vulnerability to Harm or Illness, VH; Enmeshment/Undeveloped Self, EM; Entitlement/Grandiosity, ET; Insufficient Self-Control/Self-Discipline, IS; Subjugation, SB; Self-Sacrifice, SS; Approval-Seeking/Recognition-Seeking, AS; Emotional Inhibition, EI; Unrelenting Standards/Hypercriticalness, US; Negativity/Pessimism, NP; and Punitiveness, PU.



**Table 2**  
Demographic and pain variables in meaningful and non-meaningful schema groups.

Variable	Non-meaningful schema group		Meaningful schema group		p
	113 <sup>a</sup>		158 <sup>a</sup>		
	Mean	SD	Mean	SD	
Sex, number of males/females	55/58		72/86		.61 <sup>b</sup>
Age in years	46.7	8.9	47.3	9.5	.64 <sup>c</sup>
Education in years	11.0	1.5	11.1	1.7	.69 <sup>c</sup>
Pain intensity, mean	5.6	1.2	6.1	1.2	.005 <sup>c</sup>
Duration of pain in years	7.9	7.7	10.4	9.4	.022 <sup>c</sup>
Number of pain locations	2.0	1.2	2.2	1.3	.18 <sup>c</sup>
Pain disability scale (PDS; range 0–27)	15.6	4.8	17.1	5.2	.013 <sup>c</sup>

<sup>a</sup> Number.

<sup>b</sup> Pearson's Chi-square.

<sup>c</sup> Student's *t*-test.

**Table 3**  
Examples [extracts] from the speech of pain patients with the highest scored Unrelenting Standards/Hypercriticalness (US) or Self-Sacrifice (SS) schemas.

**Man, 53 years, entrepreneur, shoulder pain with many shoulder operations, the 1st strongest US and the 3rd strongest SS schema**

P(atient): Yes, it is aching, it is aching, but the situation is such that I haven't had time to rehabilitate myself. Immediately when I could get about I started a job. As an entrepreneur, I haven't had much time to lounge. As soon as I have been able to walk I have gone. . .

**Man, 63 years, entrepreneur, retired, back pain, the 1st strongest SS schema**

P: I've never saved myself, I worked day and night – if this backache had been treated in good order, it wouldn't be like this. However, when this was at its worst, the work was in a situation that I could not stop working just due to my own health [pain].

**Man, 60, retired, widespread arthrosis, the 2nd strongest US schema**

D(ctor): What do you think about your future?

P: I hope I'll manage. I even take the pain killers as little as possible although the doctors say that one should not suffer pain, but I have taken as few as possible.

D: You keep your head above water?

**Man, 60 years, technician, low back pain, the 4th strongest US schema**

D: You had a fight with a tractor?

P: It was a hell of a lift with this plank I tried to free the tractor from the stump while the engine was running and it jerked towards me when I took hold of the plank and this right leg was the lifting leg, it really jerked me, when I held it like this [the patient shows how he tried to lift the tractor with the plank] and as long as I had the strength I tried until the machine got the better of me and that was that. It felt funny there was no pain at the time. . .

**Woman, 40 years, secretary, head-neck-shoulder pain, the 2nd strongest US schema**

D: You mean that people close to you don't believe [your pains]?

P: Well, my mother believes me, but people who know me as a bundle of energy, as one who takes care of everything, they couldn't ever imagine, because I do not show the pain, I don't lie down when I have a lot of pains, I must do all the time.

. . .

D: We have now spoken about your symptoms, thoughts and emotions – how has this all affected your life, work and hobbies?

P: I don't let it affect them. . . I have never been off work because of these pains.

D: Would you have liked to be?

P: Yes, sometimes, but there hasn't been any concrete for being off [reason]

D: It is not concrete that you sleep only two hours in a row?

P: Uhm, yes, but. . . I am. . . how could I say. . . I am assiduous, diligent, hardworking, nice and good, so I do everything that is agreed however much pain I felt.

**Woman, 54 years, cleaner, widespread pain, the 3rd strongest SS schema**

D: How long have you been married?

P: 28 years comes next.

D: How long has he been beating you since then?

P: Almost all the time, first when he was drunk. . . and now when he had the palsy, I got him back into condition, and then he started it again.

D: Then the beating started again?

P: Yes. . .

Note: To ensure anonymity demographics have been altered.

connections between early adversities and chronic pain [1–9] and between early negative childhood experiences and EMSs [29] have been shown. Therefore, we hypothesize that chronic pain patients have EMSs. These may in turn produce unhealthy life patterns. Examining EMSs offers a method of measuring the existence of early emotional trauma and, in addition, offers a method for treating these patients [24].

## 4. Results

### 4.1. Early maladaptive schemas

From the total of 271 chronic pain patients 158 (of men 56.7%; of women 59.7%) scored one or more EMSs as meaningful (one schema = 21.4%, 2–4 schemas = 24%, 5–10 schemas = 9.6% and 11–16 schemas = 3.3%). The meaningful schema distribution in men

and women is shown in Fig. 1. In men the scores for Unrelenting Standards/Hypercriticalness (US) and Self-Sacrifice (SS) EMSs and in women SS and US EMSs showed the highest occurrence in that order of magnitude.

The meaningful and non-meaningful schema groups did not differ by sex, age or length of education. However, patients scoring on one or more EMSs as meaningful had more intense, longer duration and more disabling pain (Table 2). The pain sites or the number of pain locations did not differ between these groups.

### 4.2. Manifestation of SS and US schemas in the speech of pain patients

Based on the analyses in Section 4.1, we selected 5 male and 5 female pain patients scoring highest on US or on SS schemas (totally *n* = 20 cognitive case formulations). US schema can be recognized as

**Table 4**  
Linear regression analyses (enter method) of factors predicting pain disability in male, female and total pain patient samples.

Independent variable	Men					Women					Total sample							
	$\beta$ (stand.)	$R^2$	F	t	Sig.	df	$\beta$ (stand.)	$R^2$	F	t	Sig.	df	$\beta$ (stand.)	$R^2$	F	t	Sig.	df
Age	.062	0.248	5.56	.713	<.001	7,118	.166	0.236	5.99	2.06	<.001	7,136	.130	.245	14.3	2.32	<.001	6,263
Duration of education	-.067			-.80	.425		.103			1.31	.192		.034			.628	.530	
Mean pain intensity	.311			3.77	<.001		.215			2.67	.009		.258			4.73	<.001	
Number of pain sites	.282			3.44	.001		.257			3.31	.001		.210			3.76	<.001	
Duration of pain	.164			1.91	.058		-.006			-.07	.942		.049			.858	.392	
US	-.02			-.17	.86		.206			2.55	.012		.214			3.83	<.001	
SS	.04			-.38	.71		-.084			-1.0	.303							

Note:  $\beta$  (stand.), standardized regression coefficient;  $R^2$ , coefficient of determination; F, F-value; t, Student's t-value; df, degree of freedom. Unrelenting Standards/Hypercriticalness, US; Self-Sacrifice, SS; Emotional Deprivation, ED.

perfectionism in the work, rigid rules in many areas of life (a lot of “shoulds”) and preoccupation with time and efficiency. SS schema can be recognized as an urge for one to focus voluntarily on fulfilling the needs of others at the expense of one's own gratification [24].

The most common and obvious feature of patients in both genders scoring high on SS and US EMSs was the importance of work and accomplishments. There was a dilemma in their speech: almost all of them reported that there had been too much work [since childhood] which had caused them to suffer pain and prevented them from recovering from pain and, at the same time, they hoped to be in less pain to return to the same work [conditions].

The men scoring high on US EMS ignored their pain treatment and preferred to work, they did not accept the use of pain medication and they had difficulties in trusting that others could do things properly. They also had difficulties in accepting help in their daily activities even when in pain. They thought that they did not get enough help from the health care system. All of the women scoring high on US EMS were workaholic and described their identity in the terms of working attitudes and skills. While on a sick leave, one of them even helped out daily in her office.

The men scoring high on SS EMS had a similar attitude to the men scoring high on US EMS (two of them scored high on US schema, too) “work before health”. They were also concerned about others' problems and helped other people at their own expense. They even felt responsible for how others were feeling; that is, they had to keep others happy. The women scoring high on SS EMS had difficulties in focusing on questions concerning themselves. They did not express pain [to the people nearby] and did not like to bother others by asking help for themselves although they were exhausted with pain. They hid their pain and were ready to sacrifice for others; one woman scoring high on SS EMS told her spouse that he should leave her because she was such a painful burden.

Typical examples of high scoring SS and US schema speech are presented in Table 3.

#### 4.3. Demographics, EMSs and pain characteristics as predictors of pain and disability

In the first regression analyses, age, the duration of education, US and SS schemas were entered as independent variables to predict pain intensity. No significant associations were found either in males or females. In the second regression analyses, age, the duration of education, pain intensity, the duration of pain, the number of pain sites, US and SS schemas were entered as independent variables to predict pain disability. Among males, the model predicted pain disability 24.8% by pain intensity and the number of pain sites, and among females, the model predicted pain disability 23.6% by pain intensity, the number of pain sites, SS schema and to a lesser degree by age (Table 4).

*Post hoc*, as SS and US schemas are regarded as conditional and may cover underlying Emotional Deprivation (ED) EMS [24], a third regression analysis was conducted on the total sample. Age, the duration of education, pain intensity, the duration of pain, the number of pain sites, and ED schema were entered as independent variables to predict pain disability. This model predicted pain disability 24.5%. Pain intensity, the number of pain sites and ED schema had equal significance and almost equal standardized coefficients (.258; .210; .214, respectively). Increasing age also had some predictive value for pain disability (.130) (Table 4).

## 5. Discussion

More than half of the pain patients scored early maladaptive schemas (EMS) as meaningful. Men mostly scored on Unrelenting Standards/Hypercriticalness (US) and Self-Sacrifice (SS) EMSs and

women on SS and US EMSs respectively and in that order of magnitude. Self-Sacrifice schema in women and Emotional Deprivation schema in the total sample were associated with pain disability. To the best of our knowledge, this is the first paper to study the influence of EMSs on chronic pain patients.

All 18 EMSs were present as meaningful in the sample. The pain population scoring EMSs as meaningful had more intense pain, longer duration of pain and more pain disability. This suggested that early emotional adversities may even predispose to more intense pain disease. This concurs with earlier studies [10,11].

Self-Sacrifice (SS) schema was the highest scored schema in women and the second highest scored schema in men in this study. In the speech analyses the pain patients with meaningful SS schema gave their time, support, help and empathy to others and neglected their own needs and finally became *pain-exhausted*, because only the maximum pain was able to stop them. They often assumed a caregiver's role and hid their pain. According to Young et al. [24] the patient with SS schema almost always has an accompanying Emotional Deprivation (ED) schema, which she/he seldom recognizes. The patient focuses on the needs of others, which works for the ED schema maintaining coping style – her/his own needs will remain unrecognized and unmet. They state that *'it is common for patients with this schema to have psychosomatic disorders such as headaches, gastrointestinal problems, chronic pain or fatigue'* [24].

Unrelenting Standards/Hypercriticalness (US) schema was the highest scored schema in male and the second highest scored EMS in female pain patients. Analysis of speech showed that US schema precipitated the pain problem, as the pain patients were very conscientious in their work and did not listen to their bodies. The patients were workaholics and ignored their bodily sensations or rehabilitation. They also often tried to use as few painkillers of every kind as possible. We wonder if US schema explained the disappointment with earlier care and the vast amount of ineffective treatments in their stories. We ask if the demands of patients scoring high on US schema cast the pain treating personnel in the role of trying all possible tricks. US schema is also regarded as a compensatory schema for ED and Defectiveness/Shame schemas [24].

Counterdependency [30] is characterised by emotional suppression, the idealization of relationships, strong work ethics, caregiver role-identity and self-reliance. Counterdependency was found as a trait typical of a chronic pain patient subgroup and it was independent of alexithymia, anxiety, depression and somatic amplification [31]. Interestingly, strong work ethics according to the US and AS schemas (=Approval-Seeking/Recognition-Seeking, the 3rd highest occurring schema in male pain patients, Fig. 1), and caregiver role identity by SS schema are similar to counterdependency suggesting the existence of similar personal traits as seen in this study. Van Houdenhove et al. [32] used the term 'action-proneness' for an overactive lifestyle found in patients with chronic fatigue syndrome (CFS) and fibromyalgia (FM). More specifically, the patients had a tendency to exceed their physical limits, strive frenetically for achievement, approval or perfection. They supposed action-proneness to be a predisposing, initiating and perpetuating factor for CFS and FM. The aforementioned is highly congruent with the US and SS schema driven behavior seen in our study. Pain patients are in danger of exacerbating their pain disease when high in standards and self-sacrifice.

A personal trait of approval-seeking, self-sacrifice and unrelenting standards is also described in patient cases of emotional deprivation disorder [33]. Young et al. state (p. 215; [24]) *"This [Emotional deprivation] is probably the most common schema we treat in our work, although patients frequently do not recognize that they have it"*. We ask if pain patients scoring high on US and SS schemas also suffer from emotional deprivation, namely, deprivation of nurture, empathy and/or protection. This would concur with

the findings of Imbierowicz and Egle [5] that pain patients with fibromyalgia and somatoform pain disorders reported, e.g. lack of physical affection, a poor emotional relationship with both parents and separation. Emotional abuse with other adversities was found to be related to female breast pain [34], to an increased number of different pain conditions in individual migraine patients [35], to an increased prevalence of pelvic pain in men [6] and to the number of pain disorders in adulthood [8]. Women with chronic pelvic pain suffered more emotional neglect in their childhood than women in the pain-free control group [7]. The mediating role of emotional trauma in the development of chronic pain was hypothesized by Rome and Rome [36] and the neurobiological basis was explained by corticolimbic sensitization.

According to the regression analyses pain intensity was not predicted by any of the measures used. Among women Self-Sacrifice schema predicted pain disability more than increasing age but to a lesser degree than mean pain intensity or number of pain sites. In the total sample, Emotional Deprivation (ED) schema predicted pain disability to the same extent as pain intensity and the number of pain sites and more than increasing age. When the ED schema valence increased the chronic pain patient suffered more inability to live and cope with pain. Patients with ED schema do not seek help and do not believe that anybody can or will help them; on the other hand, Young et al. [24] state *'patients may have many physical complaints – psychosomatic symptoms – with the secondary gain of getting people to pay attention to them and take care of them (although this function is almost always outside their awareness)'* [24].

The sample was collected from several secondary and tertiary pain clinics from different types of public hospitals in Finland. The proportion of patients who refused to participate was low. The age range represented typical pain patient distribution. The pain sites were scattered throughout the body. We therefore assume that the results represent Finnish chronic pain patients in pain clinics. It is believed that abuse is underreported [3]. The effect of this underreporting would be the inclusion of sexual or psychological abuse survivors in the control groups. This in turn may diminish the effect size of association between aforementioned adversities and somatic outcomes. Measuring subjective beliefs, thoughts and attitudes with a questionnaire is controversial. Many of the EMSs not evaluated here may be as relevant to the development of or coping with a chronic somatic condition such as chronic pain. It would be interesting to know how specific these EMS patterns are for chronic pain patients and to compare them with patients having other chronic diseases and with general population. These questions, however, are unfortunately beyond the scope of the present study. This study was cross-sectional and thus unable to determine the specific causal relationships between EMSs, pain characteristics and pain disability. However, the assessment of the content of the speech of chronic pain patients revealed several ways in which meaningful schemas affected their behavior in a way that increased their pain. The study should be replicated with a control sample and in a different cultural setting. We also consider the pain disability scale used in this study to be a limitation. It was based on a pain disability scale used in many pain clinics in northern Finland.

### 5.1. Conclusions and implications

More than half of the chronic pain patients scored one or more early maladaptive schemas as meaningful, indicating the possibility of early emotional trauma. The patients scoring EMSs as meaningful had significantly higher pain intensity, the duration of pain and pain disability. Male and female chronic pain patients scored mostly Unrelenting Standards/Hypercriticalness and Self-Sacrifice (SS) schemas. The most scored EMSs served as an independent trap for the perpetuation of chronic pain. According to the data,

Emotional Deprivation schema was associated with pain disability as much as pain intensity and the number of pain sites. In female patients, pain disability was also associated to a significant degree with SS schema. The assessment of EMSs in chronic pain patients may offer an opportunity to elicit the pain perpetuating lifestyle and to understand patients' difficulties in following treatment guidelines. The schema therapeutic approach can be one tool more relieving persistent pain and disability.

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## Health and Disability

# Early maladaptive schemas in Finnish adult chronic pain patients and a control sample

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Engel (1959) suggested that negative physical or emotional experiences in childhood predispose to the development of chronic pain. Studies have shown that physical and sexual abuse in early life is connected with chronic pain. Emotional adversities are much less studied causes contributing to the development of chronic pain and disability. Early emotional abuse, neglect, maltreatment and other adversities are deleterious childhood experiences which, according to Young's schema theory (1990), produce early maladaptive schemas (EMSs). The primary goal of this study was to examine whether early adversities were more common in chronic pain patients than in a control group. A total of 271 (53% women) first-visit chronic pain patients and 331 (86% women) control participants took part in the study. Their socio-demographic data, pain variables and pain disability were measured. To estimate EMSs the Young Schema Questionnaire was used. Chronic pain patients scored higher EMSs reflecting incapacity to perform independently, catastrophic beliefs and pessimism. The most severely disabled chronic pain patients showed an increase in all the EMSs in the Disconnection and Rejection schema domain, namely Abandonment/Instability, Mistrust/Abuse, Emotional Deprivation, Defectiveness/Shame and Social Isolation/Alienation EMSs. The results of the study suggested that chronic pain patients had suffered early emotional maltreatment.

**Key words:** Emotional maltreatment, early maladaptive schema, young schema questionnaire, chronic pain, pain disability.

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## INTRODUCTION

Half a century ago Engel (1959) introduced his view of “pain-prone patient” and hypothesized that various constellations of negative childhood physical or emotional experiences, such as abuse, punishment and neglect established a proclivity towards the development of pain in excess to what would be expected for the known peripheral stimulus (e.g. lesion). The biopsychosocial model of illness (Engel, 1977) highlights the importance of biological, psychological and environmental contributions to the aetiology and therapy of all diseases. Grzesiak (1994) attempted to unite Engel's (1959) theory of the pain-prone patient to the neuromatrix theory of Melzack (1991) and gave equal valence to the psychological and body selves in the formation, relief and prevention of chronic pain syndrome. Rome and Rome (2000) investigated chronic pain, kindling phenomenon and neuroplastic changes in the brain and proposed a model in which lifetime experiences and somatosensory inputs may produce the neural network to form persistent pain and affective and behavioural changes. Although there is a wealth of evidence pointing to the biological factors associated with chronic pain, there is a growing body of evidence of social and psychological factors affecting the course and outcome of pain (e.g. Burton, Tillotson, Main & Hollis, 1995; Gatchel, Polatin & Mayer, 1995; Linton, 1997; Monti, Herring, Schwartzman & Marchese, 1998).

Medically explained and unexplained physical symptoms are associated with childhood maltreatment (Arnow, 2004). Studies have stressed the role of childhood sexual and physical traumas and maltreatment as predisposing individuals to chronic pain (Arnow, Hart, Hayward, Dea & Taylor, 2000; Brown, Berenson &

Cohen, 2005; Davis, Luecken & Zautra, 2005; Finestone, Stenn, Davies, Stalker, Fry & Koumans, 2000; Walsh, Jamieson, MacMillan & Boyle, 2007). Sexual and physical abuse is easier to recognize than more covert emotional abuse. ‘Emotional abuse and neglect will continue to pose a challenge to professionals concerned with ensuring the well-being of children’ (Glaser, 2002, p. 711). Depression is often claimed to be a mediator between childhood trauma and pain, but sexual abuse per se is also associated with adult chronic pain (Brown *et al.*, 2005). The same has also been found between physical abuse and pain (Walsh *et al.*, 2007).

An association of chronic pain with both childhood physical and/or sexual abuse and emotional adversities has been reported in many studies (e.g. Hu, Link, McNaughton-Collins, Barry & McKinlay, 2007; Imbierowicz & Egle, 2003; Lampe, Sölder, Ennemoser, Schubert, Rumpold & Söllner, 2000; Sansone, Pole, Dakroub & Butler, 2006; Thomas, Moss-Morris & Faquhar, 2006). The association of chronic pain with emotional maltreatment alone has been much less studied; however, emotional abuse and neglect have been shown to be associated with fibromyalgia (Van Houdenhove, Neerinx, Lysens *et al.* 2001; Walker, Keegan, Gardner, Sullivan, Bernstein & Katon, 1997).

Young's (1990) schema theory is based on early maladaptive schemas (EMSs), which refer to dysfunctional cognitive frameworks developed primarily in childhood and elaborated throughout an individual's life. These patterns may support survival in youth and nuclear family but later on in adult life turn out maladaptive (Young, Klosko & Weishaar, 2003). The origins of maladaptive schemata are, for example, in lack of support, understanding and affection (Emotional Deprivation EMS), maltreatment (Mistrust/ Abuse EMS), rejection (Abandonment/

Instability EMS) (Young, 1999; Young *et al.*, 2003). There are now 18 EMSs grouped into 5 schema domains, namely Disconnection and Rejection (expectation that one's needs for, e.g., security, safety, stability, nurturance and empathy will not be met in a predictable manner); Impaired Autonomy and Performance (expectations about oneself and the environment that interfere with one's perceived ability to, e.g., separate, survive or perform successfully); Impaired Limits (deficiency in internal limits, responsibility to others or long-term goal orientation), Other-Directedness (an excessive focus on the desires, feelings and responses of others at the expense of one's own needs in order to gain, e.g., love and approval) and Overvigilance and Inhibition (an excessive emphasis on suppressing one's spontaneous feelings, impulses and choices or meeting, e.g., rigid internal rules at the expense of happiness, self-expression and relaxation) (Young, Weinberger & Beck, 2001). Every domain represents one important part of the core needs of the child. Emotional neglect, maltreatment and abuse in childhood produce, for example, EMSs which belong to the Disconnection and Rejection schema domain and are unconditional reflecting fixed beliefs about self and others and are proposed to develop earliest in life. EMSs are associated with a vast spectrum of psychopathology such as eating disorders (Anderson, Rieger & Caterson, 2006; Leung, Waller & Thomas, 1999), depression (Baranoff, Oei, Cho & Kwon, 2006; Harris & Curtin, 2002; Waller, Shah, Ohanian & Elliot, 2001), occupational stress (Bamber & McMahon, 2008) and suicidality (Dutra, Callahan, Forman, Mendelsohn & Herman, 2008).

Chronic pain is associated with many kinds of early adversities. EMSs yield knowledge about deleterious experiences in childhood. The aims of this study were (1) to investigate and compare EMSs and schema domains among chronic pain patients and control participants and (2) to ascertain how EMSs and schema domains are connected with different pain variables. We hypothesize that chronic pain patients show a rise in EMSs. We also hypothesize that in the pain patient population there are subgroups suffering from early emotional maltreatment which can be seen as a rise in the earliest EMSs and Disconnection and Rejection schema domain.

## METHOD

### Participants

**Pain patients.** Consecutive 18–64-year-old first-visit pain patients were recruited for this study from six pain clinics in central and northern Finland during a period of one year (January 2004–2005). Sources of referral included primary health care and various medical specialists. The patients were informed in advance about the study protocol by letter. Every patient attending the pain clinic was given the questionnaire by which the data was gathered. Patients having a primary psychotic disorder, a cognitive impairment or an inability to complete questionnaires were excluded from the study. A clinical nurse provided assistance if a patient had problems in completing the questionnaire. From 318 eligible patients 15% refused to take part in the study, so there were 271 participants. All these patients were suffering from non-malignant, daily, chronic pain lasting three months or longer (International Association for the Study of Pain, 1986). The typical pain diagnoses were sciatica, arthrosis and neuropathic pain.

**Control group.** The control group was recruited from employees of Raahe town administration ( $n = 918$ ; women  $n = 728$ ; men  $n = 190$ ).

In attempting to match the groups the inclusion criterion in the control group was age 18–65 years. All the municipal officials were informed beforehand by an electronic weekly bulletin that a control group for a chronic pain study was needed and that everyone would receive a questionnaire to complete within one month (March 2005). These officials were also informed that the study was based on total anonymity and was voluntary. A total of 331 individuals (36%) participated in the study.

The pain patient group had a mean age of 47 years and it consisted of 127 males (47%) and 144 females (53%). The mean age of the control group was 47 years and it consisted of 40 males (12%), 284 females (86%) and 7 (2%) with gender not reported. The mean duration of education was 11 years and 13 years respectively. The duration of education was estimated from the occupation. The pain and control groups were found to be comparable in age. However, the groups did differ significantly in their gender distribution ( $\chi^2 = 87.1$ ;  $p < 0.001$ ) and in the duration of education ( $t = 10.6$ ;  $p < 0.001$ ) (Table 1). The response rate in the pain patient group was high ( $n = 268$  of 271 participants in all parameters). The response rate in the control group was lowest for age ( $n = 304$  of 331 participants) and for the duration of pain (319/331). For the rest of the pain variables, EMS and schema domain data it was high ( $n = 322$  of 331 participants). The study protocol was approved by the ethical committee of the Northern Ostrobothnia Hospital District. Written informed consent was obtained from all participants.

### Measures

**Early Maladaptive Schemas (EMSs).** The participants completed the Finnish version of the Young Schema Questionnaire – short form (=YSQ-S2-extended: 90 items, 18 EMSs; Saariaho, Saariaho, Karila & Joukamaa, 2009). This includes the YSQ-S2, which is a 75-item, 15 EMS self-report, Likert-type questionnaire (Young & Brown, 2003) and also contains five Approval-Seeking/ Recognition-Seeking, five Negativity/ Pessimism and five Punitiveness schema items. A value of 1 means “Completely untrue of me” and a value of 6 means “Describes me perfectly”. The mean of every subscale is calculated and higher values describe stronger schema valence and a more maladaptive core belief. The YSQ-S2-extended is designed to assess 18 EMSs under 5 schema domains. Disconnection and Rejection schema domain: Emotional Deprivation EMS (= ED; item #5: “I have rarely had a strong person to give me sound advice or direction when I’m not sure what to do”); Abandonment/ Instability EMS (= AB; item #8: “I worry that people I feel close to will leave me or abandon me.”); Mistrust/ Abuse EMS (= MA; item #15: “I’m usually on the lookout for people’s ulterior motives.”), Social Isolation/ Alienation EMS (= SI; item #19: “I feel alienated from other people.”) and Defectiveness/ Shame EMS (= DS; item #24: “I feel that I’m not lovable.”). Impaired Autonomy and Performance schema domain: Dependence/ Incompetence EMS (= DI; item #31: “I do not feel capable of getting by on my own in everyday life.”), Vulnerability to Harm or Illness EMS (= VH; item #37: “I feel that a disaster (natural, criminal, financial, or medical) could strike at any moment.”), Enmeshment/ Undeveloped Self EMS (= EM; item #43: “It is very difficult for my parent(s) and me to keep intimate details from each other, without feeling betrayed or guilty.”) and Failure EMS (= FA; item #30: “I’m not as intelligent as most people when it comes to work (or school).”). Impaired Limits schema domain: Entitlement/ Grandiosity EMS (= ET; item #68: “I hate to be constrained or kept from doing what I want.”) and Insufficient Self-Control/ Self-Discipline EMS (= IS; item #74: “I can’t force myself to do things I don’t enjoy, even when I know it’s for my own good.”). Other-Directedness schema domain: Subjugation EMS (= SB; item #50: “I have a lot of trouble demanding that my rights be respected and that my feelings be taken into account.”), Self-Sacrifice EMS (= SS; item #51: “I’m the one who usually ends up taking care of the people I’m close to.”) and Approval-Seeking/ Recognition-Seeking EMS (= AS; item #80: “Lots of praise and compliments make me feel like a worthwhile person”). Overvigilance and Inhibition schema domain: Negativity/ Pessimism EMS (= NP; item #83: “You can’t be too careful; something will almost always go wrong.”), Emotional Inhibition EMS (= EI; item #57: “I find it embarrassing to express my

Table 1. Age, gender, duration of education and pain variable statistics in the pain patient and control groups

Variable	Pain patient group			Control group			Significance
	M	SD	Range	M	SD	Range	<i>p</i>
Age	47.0	9.3	18–64	47.4	9.5	19–62	0.60
Gender (male/female) <sup>a</sup>			127/144			40/284	<0.001*
Duration of education in years	11.4	1.7	9–18	13.2	2.9	10–18	<0.001‡
Mean pain intensity (VAS)	5.9	1.2	2.5–9.5	2.8	2.0	0–8.3	<0.001†
Duration of pain in years	9.3	8.8	0.25–36	2.4	2.4	0–6	<0.001†
Number of pain sites	2.1	1.3	1–6	1.4	1.2	0–5	<0.001†
Pain disability scale	16.5	5.1	3–27	5.1	4.7	0–22	<0.001†

Notes: VAS is the Visual Analogical Scale.

<sup>a</sup> In the control group gender was not reported in 7 cases.

\* Chi-square test

‡ Student's *t*-test

† Mann-Whitney U test

feelings to others.”), Unrelenting Standards/ Hypercriticalness EMS (=US; item # 63: “I must meet all my responsibilities.”) and Punitive-ness EMS (=PU; item #90: “I often think about mistakes I’ve made and feel angry with myself.”). The Cronbach alphas for the individual EMS subscales varied between 0.94 and 0.79 in the pain patient group and between 0.94 and 0.81 in the control group. In all cases these alpha levels were well above 0.70. The construct validity and reliability of the YSQ-S2 have been shown to be good (Waller, Meyer & Ohanian, 2001; Welburn, Coristine, Dagg, Pontefract & Jordan, 2002). The reliability and 18-factor structure of the YSQ-S2-extended in Finnish language has been established (Saariaho *et al.*, 2009).

**Pain.** The pain questionnaire was developed for this study to collect information on patients’ socio-demographic data (age, occupation, gender), pain localization (body map), the onset of the pain disease, the temporal quality of the pain, and the current pain intensity measured with two 10 cm Visual Analogue Scales (VAS). On the first VAS (pain max) patients were asked to rate their current maximal experienced pain (0 = “no pain” to 10 = “worst pain one can imagine”) and on the second VAS (pain min) their current minimal experienced pain (0 = “no pain” to 10 = “worst pain one can imagine”). Pain intensity was the mean of two VASs.

**Pain disability.** The Pain Disability Scale (PDS) was developed for this study. It is a 9-item self-report scale consisting of seven direct statements: “My pain is disturbing my sleep”, “... my hobbies”, “... my sex life”, “... my work”, “... my ability to move”, “... my economy”, “... my social contacts”, and two inverted statements: “I can enjoy life despite my pain”, “I can control my pain”. All the items were self-reported on a Likert-type 0–3 scale: 0 = not at all; 1 = to some extent; 2 = significantly; 3 = very much. The total score (= sum; range 0–27) reflects the overall level of pain disability. Cronbach’s alpha for the PDS was 0.83 and 0.88 in the pain patient and control groups respectively.

### Procedure and data analysis

Socio-demographic, pain variable and EMS data were compared between the pain and the control groups. Post hoc, as there was a statistically significant difference in the distribution of gender, we made group comparisons between the sexes in the control and pain patient groups separately. The Fisher skewness and kurtosis coefficients showed a most non-normal distribution (outside  $\pm 1.96$ ; Pett, 1997, pp. 35–40) in all other variables except in pain intensity and pain disability in the pain patient group and SS EMS in the control group. The value of each schema domain was the mean of the respective schemas and the individual EMS values were the mean of the five respective schema items. Chi-square test was used with categorical data, Mann-Whitney U-test with non-normally distributed data and Student’s *t*-test with normally distributed data. Spear-

man’s correlation ( $\rho$ ) was used in non-normally distributed data. The association was regarded as small if  $\rho$  was  $\pm 0.1$  –  $\pm 0.29$ , medium if  $\pm 0.30$  –  $\pm 0.49$  and large if  $\pm 0.50$  –  $\pm 1.0$  (Cohen, 1988). To see how different pain variables were connected to EMS and schema domain values, both groups (pain and controls) were dichotomized in the following way (see Turner, Rose & Cooper, 2005):

- **Top group.** The top group consisted of the top 20% of sufferers ( $n = 54$  in the pain patient group;  $n = 64$  in the control group) of pain intensity, pain duration, number of pain sites or pain disability scale score.

- **Bottom group.** The bottom group consisted of the bottom 20% of sufferers ( $n = 54$  in the pain patient group;  $n = 64$  in the control group) of the pain intensity, pain duration, number of pain sites or pain disability scale score. Thus there were four Top-Bottom pairs in the pain patient sample and four Top-Bottom pairs in the control group (e.g. 54 pain patients scoring pain disability highest and 54 pain patients scoring pain disability lowest). The schema domain and EMS scale means between all the eight Top-Bottom pairs were analyzed with the Mann-Whitney U-test in every one pair separately.

The data was analyzed using SPSS (16.0.1. for Windows). To reduce the possibility of type 1 error only a statistical significance level of  $< 0.01$  was used in this paper.

## RESULTS

### Pain data

In all pain variables, the groups differed highly significantly ( $p < 0.001$ ). There were 54 control participants (16.3%) who had no pain and the mean pain intensity was mild (VAS = 2.8) in the control group and severe (VAS = 5.9) in the pain group. The mean duration of pain was 2.4 years in the control group and 9.3 years in the pain patient group. Mean number of pain sites was 1.4 and 2.1 respectively. Pain disability was rated “to some extent” (PDS = 5.1) in the control group and “remarkable” (PDS = 16.5) in the pain patient group (Table 1).

### EMS and schema domain data

In the control group there were no statistically significant gender differences between any variables. In the pain patient group there

were statistically significant differences between men and women in ED, ET, EI and US EMSs, Overvigilance and Inhibition schema domain and pain disability. Men had higher scores on all of them. The Impaired Autonomy and Performance schema domain was significantly higher in pain patients ( $p = 0.004$ ). From the individual EMS values Dependence/ Incompetence ( $p < 0.001$ ), Vulnerability to Harm or Illness ( $p = 0.004$ ) and Negativity/ Pessimism ( $p = 0.003$ ) had statistically significantly higher values in the pain patient group and Emotional Deprivation almost reached statistical significance ( $p = 0.014$ ) (Table 2).

#### EMS and schema domain top and bottom data

**Pain patient group.** Top (VAS = 7.7) and bottom (VAS = 4.2) pain intensity groups differed statistically significantly (Table 3) in two schemas, namely Mistrust/Abuse and Dependence/Incompetence EMSs, and in two schema domains, namely Disconnection and Rejection and Impaired Autonomy and Performance, which all had statistically significantly higher values in the top group. Top and bottom groups of the number of pain locations (4.0 vs. 1.0) and duration of pain (24.0 vs. 1.2 years) did not differ in any EMS or schema domain values. Top and bottom groups in pain disability scale score (23 vs. 9) differed in Disconnection and Rejection, Impaired Autonomy and Performance and Overvigilance and Inhibition schema domains, which had statistically significantly higher values in the top group. The values of Abandonment/Instability, Mistrust/Abuse, Emotional Deprivation,

Defectiveness/Shame, Social Isolation/Alienation (SI), Dependence/Incompetence (DI), Vulnerability to Harm or Illness, Subjugation (SB), Negativity/ Pessimism (NP), Emotional Inhibition and Punitiveness EMSs were statistically significantly higher in the top group of pain disability. There was a medium-sized association between pain disability and SI ( $\rho = 0.36$ ), DI ( $\rho = 0.36$ ), SB ( $\rho = 0.30$ ), NP ( $\rho = 0.32$ ) EMSs, Disconnection and Rejection ( $\rho = 0.36$ ) and Impaired Autonomy and Performance ( $\rho = 0.35$ ) schema domains.

**Control group.** Top (VAS = 5.6) and bottom (VAS = 0.1) pain intensity, number of pain locations (3 vs. 0), duration of pain in years (6 vs. 0) and pain disability scale score (12 vs. 0, respectively) groups did not differ significantly in any EMSs or schema domains.

#### DISCUSSION

We found that the chronic pain patient and control groups differed in Impaired Autonomy and Performance schema domain reflecting activity of Dependence/Incompetence and Vulnerability to Harm or Illness EMSs, which had higher values in the pain patient group. They also showed an increase in the Negativity/Pessimism EMS. The main finding was that pain disability showed most variation in schema domain and EMS activity, but only in the pain patient group. Chronic pain patients – who were most disabled – had most EMS activity, which suggested early emotional maltreatment. To the best of our knowledge this was the first paper to

Table 2. Schema domain and individual EMS subscale means and standard deviations in the pain patient and control groups

	Pain patient group		Control group		Significance  <i>p</i> *
	<i>n</i> = 271		<i>n</i> = 331		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<i>Disconnection and Rejection</i>	1.79	0.89	1.59	0.58	0.182
Abandonment/ Instability (AB)	1.84	1.06	1.69	0.72	0.746
Mistrust / Abuse (MA)	1.69	0.92	1.59	0.66	0.972
Emotional Deprivation (ED)	1.96	1.15	1.66	0.88	0.014
Defectiveness/ Shame (DS)	1.58	0.98	1.41	0.68	0.120
Social Isolation/ Alienation (SI)	1.89	1.16	1.60	0.76	0.063
<i>Impaired Autonomy and Performance</i>	1.63	0.73	1.42	0.48	0.004
Dependence/ Incompetence (DI)	1.58	0.84	1.26	0.46	<0.001
Vulnerability to Harm or Illness (VH)	1.79	1.03	1.49	0.68	0.004
Enmeshment/ Undeveloped Self (EM)	1.34	0.71	1.26	0.50	0.442
Failure (FA)	1.80	1.05	1.66	0.80	0.495
<i>Impaired Limits</i>	1.79	0.79	1.64	0.57	0.161
Entitlement/ Grandiosity (ET)	1.69	0.86	1.57	0.63	0.553
Insufficient Self-Control/ Self-Discipline (IS)	1.88	0.93	1.72	0.70	0.133
<i>Other-Directedness</i>	2.51	0.76	2.47	0.62	0.988
Subjugation (SB)	1.51	0.86	1.41	0.59	0.662
Self-Sacrifice (SS)	3.39	1.12	3.20	0.99	0.062
Approval-Seeking/ Recognition-Seeking (AS)	2.63	1.07	2.80	1.00	0.024
<i>Overvigilance and Inhibition</i>	2.35	0.87	2.21	0.72	0.175
Negativity/ Pessimism (NP)	2.35	1.17	2.05	0.96	0.003
Emotional Inhibition (EI)	1.90	0.99	1.77	0.86	0.222
Unrelenting Standards/ Hypercriticalness (US)	2.87	1.17	2.87	1.07	0.988
Punitiveness (PU)	2.30	1.07	2.18	0.88	0.441

\* Mann-Whitney U test.



Table 3. Schema domain and early maladaptive schema means and standard deviations in the Top and Bottom groups of pain intensity and pain disability in the pain patient sample

	Intensity of pain					Pain disability				
	Bottom		Top		Significance	Bottom		Top		Significance
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
	VAS 4.2		VAS 7.7			PDS 9		PDS 23		
					<i>p</i> *					<i>p</i> *
<i>Disconnection and Rejection</i>	1.51	0.66	1.88	0.86	0.007	1.35	0.50	2.12	1.09	<0.001
Abandonment/ Instability (AB)	1.46	0.61	2.01	1.22	0.031	1.50	0.91	2.21	1.39	0.004
Mistrust / Abuse (MA)	1.37	0.59	1.79	0.84	0.002	1.32	0.52	1.95	1.11	<0.001
Emotional Deprivation (ED)	1.70	0.99	2.05	1.10	0.048	1.38	0.57	2.33	1.44	<0.001
Defectiveness/ Shame (DS)	1.37	0.69	1.61	0.99	0.169	1.23	0.51	1.80	1.30	0.007
Social Isolation/ Alienation (SI)	1.67	1.01	1.95	1.06	0.044	1.36	0.61	2.32	1.48	<0.001
<i>Impaired Autonomy and Performance</i>	1.38	0.52	1.84	0.91	0.002	1.30	0.48	1.82	0.91	<0.001
Dependence/ Incompetence (DI)	1.34	0.57	1.76	1.00	0.002	1.24	0.56	1.75	1.13	0.001
Vulnerability to Harm or Illness (VH)	1.42	0.53	2.03	1.29	0.022	1.45	0.82	2.08	1.27	0.001
Enmeshment/ Undeveloped Self (EM)	1.30	0.83	1.51	0.85	0.112	1.10	0.27	1.44	0.78	0.065
Failure (FA)	1.52	0.66	2.00	1.20	0.042	1.40	0.60	1.99	1.36	0.022
<i>Impaired Limits</i>	1.56	0.56	1.92	0.89	0.026	1.52	0.51	1.96	1.12	0.177
Entitlement/ Grandiosity (ET)	1.41	0.55	1.79	0.92	0.026	1.47	0.49	1.88	1.21	0.559
Insufficient Self-Control/ Self-Discipline (IS)	1.70	0.75	2.05	1.10	0.121	1.59	0.69	2.04	1.18	0.052
<i>Other-Directedness</i>	2.34	0.71	2.59	0.74	0.079	2.36	0.62	2.69	0.86	0.031
Subjugation (SB)	1.38	0.77	1.63	0.92	0.023	1.21	0.49	1.72	1.08	0.001
Self-Sacrifice (SS)	3.20	1.04	3.42	1.16	0.392	3.30	1.10	3.75	1.29	0.059
Approval-Seeking/ Recognition-Seeking (AS)	2.44	1.02	2.71	1.12	0.230	2.58	0.98	2.60	1.18	0.918
<i>Overvigilance and Inhibition</i>	2.12	0.74	2.52	0.93	0.024	2.05	0.67	2.63	1.06	0.003
Negativity/ Pessimism (NP)	2.05	0.95	2.54	1.20	0.039	1.88	0.90	2.88	1.37	<0.001
Emotional Inhibition (EI)	1.78	0.91	2.20	1.16	0.048	1.46	0.58	2.09	1.23	0.009
Unrelenting Standards/ Hypercriticalness (US)	2.79	1.17	2.87	1.19	0.716	2.93	1.11	2.82	1.27	0.719
Punitiveness (PU)	1.94	0.86	2.46	1.14	0.019	1.96	0.88	2.72	1.25	0.001

Notes: VAS = visual analogue scale, PDS = pain disability scale sum.

\* Mann-Whitney U test.

measure the differences in EMS activity between chronic pain patients and a control sample.

We hypothesized that chronic pain patients would show a rise in EMSs. The pain patient group showed a rise in Dependence/Incompetence, Vulnerability to Harm or Illness and Negativity/Pessimism EMSs and in the Impaired Autonomy and Performance schema domain. This domain interferes with the ability to differentiate oneself from parent figures and function independently. Patients may feel inadequate, unable to cope with their everyday responsibilities, experience helpless and exaggerated fear that a catastrophe will strike at any moment. 'Typically, parents did everything for them and overprotected them, but the opposite was also possible; the parents hardly ever cared for or watched over them' (Young *et al.*, 2003, p. 18). As the mean age of the pain patient population was just under 50 years, they had been brought up in the post World War II situation, which gives more support for the latter family situation. Times were hard and there probably was neither time nor capacity for the emotional support of children who needing soothing and comforting, but these needs were dismissed by disapproving of "whining children". Unsafe early attachment complicates the normal separation from the parents and maturation. Dependence/Incompetence EMS is described as childlike and helpless and unable to take care of oneself and to cope (Young *et al.*, 2003). With such behaviour pain patients may even be vulnerable to harmful treatment decisions made by others. Lack of self-efficacy is associated with pain and disability (Est-

lander, Vanharanta, Moneta & Kaivanto, 1994; Meredith, Strong & Feeney, 2006), and resembles the pattern of Dependence/Incompetence EMS. Behaviour driven by Dependence/Incompetence EMS may also be a call for emotional care and support.

Vulnerability to Harm or Illness EMS is the exaggerated fear that catastrophe will strike at any moment. Fear focuses on medical, emotional or external (e.g. accident, crime) catastrophes and may arouse anxiety and avoidance (Young *et al.*, 2003). The belief that something terrible is about to happen may lead the chronic pain patient to request repetitive new examinations (X-ray, nuclear magnetic resonance) and treatments (drugs, operations) which may relieve anxiety but also cause iatrogenic traumatization and increase the treatment costs. Furthermore, the repeated operations usually increase the physically felt pain. Vulnerability to Harm or Illness EMS may cause restrictions in life and resembles the fear avoidance model, which explains that back pain related fear especially is associated with impaired physical performance and increased pain disability (Al-Obaidi, Nelson, Al-Awadhi & Al-Shuwaie, 2000; Carleton & Asmundson, 2009; Turk, Robinson & Burwinkle, 2004; Vlaeyen, Kole-Snijders, Boeren & van Eek, 1995; Vlaeyen & Linton, 2000).

Negativity/Pessimism EMS patients may display a pervasive, lifelong focus on negative aspects of life, such as pain, death, loss, failure; the childhood history is hardship and loss. There may also be underlying Emotional Deprivation EMS (Young *et al.*, 2003). Negativity/Pessimism may be the most problematic of the afore-

mentioned EMSs, as it can lead to depression and to pessimism towards, for example, rehabilitation and general outcome. Total negativity can also affect the pain treating personnel.

We also hypothesized that in the pain patient population there are subgroups suffering from early emotional maltreatment which can be seen as a rise in the most early EMSs and Disconnection and Rejection schema domain. The data-analysis of the Top-Bottom pairs showed the largest variation in EMS scores between the most and least disabled pain patients, but only in the pain patient group. All the EMSs belonging to the Disconnection and Rejection schema domain (Emotional Deprivation, Abandonment/Instability, Mistrust/Abuse, Defectiveness/Shame, Social Isolation/Alienation) were higher in the most disabled ones. Young *et al.* (2003, p. 13) state that 'patients with schemas in this schema domain (especially the first four EMSs, namely Abandonment/Instability, Mistrust/Abuse, Emotional Deprivation and Defectiveness/Shame) are often most damaged. Many had traumatic childhoods.' The individual EMS items of Abandonment/Instability and Social Isolation/Alienation EMSs respectively contain statements of being abandoned and social isolation. The items of Emotional Deprivation and Mistrust/Abuse EMSs focus on psychological neglect, deprivation and betrayal and the items of Defectiveness/Shame reflect core beliefs of shame and defectiveness. In the study by Cecero, Nelson and Gillie (2004) MA, ED and DS EMSs were predicted by childhood emotional abuse, and ED and DS EMSs were predicted by childhood emotional neglect. When we pooled the aforementioned, schema theory and the data information (which mostly contained emotional items) we assume that the most disabled chronic pain patients may suffer from early, mainly emotional, maltreatment. The top and bottom groups of disability also showed the same differences in the Impaired Autonomy and Performance schema domain as previously mentioned in the general differences between the pain patient and the control groups. Subjugation, Dependence/Incompetence and Vulnerability to Harm or Illness EMSs were higher in the Top group. The problem of Subjugation EMS is that it may allow pain to control and limit life with disability. People with Subjugation EMS do not fight back; they surrender (Young *et al.*, 2003). The Top group also had higher values in the Overvigilance and Inhibition schema domain, which according to Young *et al.* (2003, p. 20) reflects suppression of spontaneous feelings, and rigidity, internalized rules on own performance at the expense of happiness, self-expression, close relationships, relaxation and good health. Unfortunately, in clinical practice (A.S. and T.S.) this is the picture of many chronic pain patients. They feel that with their pain they have lost all the good things in their lives. Of the individual EMSs, Negativity/Pessimism, Emotional Inhibition and Punitiveness had higher values (in the Top group). The picture of Negativity/Pessimism EMS was discussed previously. People with Emotional Inhibition EMS are excessively inhibited about discussing and expressing their emotions, good or bad (Young *et al.*, 2003). As assertiveness can be seen as 'good' anger (Greenberg & Paivio, 1997), pain patients with Emotional Inhibition may be prone to pain behaviour as the only way to set limits. People with Punitiveness EMS think that people – including themselves – should be harshly punished for their mistakes (Young *et al.*, 2003). Punitiveness in itself may serve as a cruel trap for the pain patient – if they obey the EMS, they become more and

more exhausted and in pain, and if they fail, they feel shame and guilt. According to the schema theory, these results suggest that becoming disabled by chronic pain is a consequence of the earliest EMSs belonging to the Disconnection and Rejection schema domain but also to the Impaired Autonomy and Performance and Overvigilance and Inhibition schema domains. It has been shown that there may be a disconnection between the perceived disability and the objectively measured functional deficit in chronic low back pain (Carleton, Abrams, Kachur & Asmundson, 2010). We ask if some of the aforementioned EMSs, for example Subjugation, Dependence/Incompetence and Negativity/Pessimism may have an effect on this subjective observation.

Pain intensity showed an increase in the Mistrust/Abuse and Dependence/Incompetence EMSs in the Top group of chronic pain patients. The increase in the Mistrust/Abuse EMS may indicate that intense pain is affected by early psychological mistrust and abuse. The increase in the Dependence/Incompetence EMS probably tells about helplessness and inability to cope with pain. The Top group of pain intensity also showed higher values of the Disconnection and Rejection and Impaired Autonomy and Performance schema domains. This supports the idea that high pain intensity is affected by early psychological trauma. The number of pain locations or duration of pain did not reveal any differences in EMSs or schema domains between the Top and Bottom groups. In the Top and Bottom groups of the control sample no EMS or schema domain values differed significantly in any pain variable.

Grzesiak (1994) distinguished chronic pain syndrome patients from individuals with chronic persistent pain as the ones who do not cope well and succumb to a broad array of biopsychosocial dysfunctions. They bring to the clinical situation vulnerability and a lack of resilience. According to our study, disabled chronic pain patients suffered from early emotional maltreatment which obviously impaired their abilities to cope. When overcome by pain, they feel that no one is on their side or there to take care of them (Emotional Deprivation), they are afraid of being abandoned (Abandonment/Instability), they do not trust people close to them and are afraid of betrayal (Mistrust/Abuse), feel social isolation (Social Isolation/Alienation) and that they are defective and worthless (Defectiveness/Shame). With such a cognitive and emotional arsenal defeat is axiomatic.

Earlier studies have shown an association between physical, sexual and/or emotional maltreatment and fibromyalgia (Imbierowicz & Egle, 2003; Sansone *et al.*, 2006; Van Houdenhove *et al.*, 2001; Walker *et al.*, 1997), chronic pelvic pain (Hilden, Schei, Swahnberg *et al.*, 2004; Hu *et al.*, 2007; Lampe *et al.*, 2000; Thomas *et al.*, 2006) and migraine (Sansone *et al.*, 2006). However, the opposite has also been documented (Ciccone, Elliott, Chandler, Nayak & Raphael, 2005; Nickel, Egle & Hardt, 2002; Raphael, Widom & Lange, 2001). The most disabled pain patients had their pain distributed all over their bodies, but mainly in the neck and shoulders (61%) and low-back (80%) regions. We venture to suggest that this paper extends the association of early emotional traumatization to chronic spine pain.

The sample was collected from several pain clinics from different types of public hospitals in Finland and the proportion of patients declining to participate was low. The age range represented typical pain patient distribution. The groups were also large. We therefore venture to suggest that the results represent

Finnish chronic pain patients fairly well. The limitations in this study lie in the self-report method of analysis. Measuring of subjective beliefs, thoughts and attitudes with a questionnaire is controversial. These findings call for qualitative studies of the pain patients' stories and speech for a better EMS analysis. The control group differed significantly from the pain patient group in gender and length of education. We assume that the higher values of ED and EI EMSs in men in the pain patient group relate to the higher value of pain disability in men. We have also found in our earlier and not yet published study that men in pain patient samples mostly suffer from US and women from SS EMSs. We think that ET EMS may be somewhat sexually related schema and higher in men. However, Rijkeboer, Bergh and Bout (2005) found no bias or corresponding tendency in differing gender or education levels. This study was cross-sectional and thus unable to empirically define the temporal cause and effect relationships. Well-defined follow-up studies will yield further information on the relationship between the transactional parent-child model and chronic pain.

Chronic pain patients showed an increase in early maladaptive schemas reflecting inability to perform and manage alone, pessimism and catastrophic beliefs. Chronic pain patients with severe pain disability had an increase in the Disconnection and Rejection schema domain reflecting early psychological maltreatment, such as emotional abuse, neglect and abandonment. They also had an increase in the Overvigilance and Inhibition schema domain reflecting rigidity and suppression of spontaneous feelings. Chronic pain patients with severe pain intensity or pain disability showed an increase in the Impaired Autonomy and Performance schema domain. The study should encourage the use of schema therapy for chronic pain patients with severe disability.

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# Early Maladaptive Schema Factors, Chronic Pain and Depressiveness: a Study with 271 Chronic Pain Patients and 331 Control Participants

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Chronic pain and depression are coexisting entities with high simultaneous prevalence. Both are linked with early adversities. Early maladaptive schemas (EMS) can be seen as a reflection of these adversities. EMSs extensively indicate underlying psychic patterns and provide a good opportunity to detect covert processes and psychic shapes (latent factors), which create the basis of how people rate their schemas. The purpose of this study was to explore these latent, higher order schema factors (SF) and to find out how they are associated with pain intensity or depression in chronic pain patients and a control sample. The study subjects consisted of 271 first-visit pain patients and 331 control participants. Sociodemographic and pain data were gathered by questionnaire; 18 EMSs were measured with the Young Schema Questionnaire (short form) and depressiveness was measured with the Beck Depression Inventory, Version II. Exploratory factor and regression analyses were used. The chronic pain patient group showed two SFs. The first SF showed a shameful, defective, socially isolated, failure, emotionally inhibited, deprived, submissive and resigned pattern. The second SF showed a demanding, approval seeking, self-sacrificing and punitive pattern. SF1 predicted more than half of the depressiveness in the pain patient sample. A three-factor structure was found in the control sample, and SFs 1 and 3 together predicted almost one-third of depressiveness. The pain patient and the control groups had a different, higher order factor structure. We assume that SF1 in the pain patients reflected a rather serious, undefined early psychic trauma and was also associated with their depressiveness. Copyright © 2010 John Wiley & Sons, Ltd.

## Key Practitioner Message:

- Chronic pain patients showed a two-factor higher order schema factor (SF) structure, which we labelled *Loser* and *Encumbered*.
- The control participants showed a three-factor structure with many similarities to earlier studies.
- The first SF (*Loser*) was strongly associated with depression in the chronic pain patients.
- The data support the view that early adversities predispose chronic pain patients to depression.
- From the therapeutic point of view, we should be able to support the ashamed, failure, dependent, incompetent, negative and vulnerable ones (*Loser*) to feel dignity and calm down the '*Encumbered*' ones to get them relaxed and their suffering bodies to heal.

**Keywords:** Chronic Pain, Depression, Early Maladaptive Schema, Early Maltreatment, Schema Therapy

## INTRODUCTION

The prevalence of chronic moderate to severe pain in European residents varies from 12% in Spain to 30% in Norway, with 19% being in Finland (Breivik, Collett, Ventafridda, Cohen, & Gallacher, 2006). The prevalence of

depression in Europe is estimated to range from 3% to 10% (Wittchen & Jacobi, 2005), with 6.5% being in the Finnish adult population (Pirkola et al., 2005). The prevalence of pain among depressive patients ranges between 5% and 100%, and the prevalence of major depression with chronic pain varies from 1.5% to 100% according to the context (population survey, primary care, pain clinic; Gambassi, 2009). The causality and temporal association of pain and depression have been a focus of numerous studies and the question still seems to lack a definitive

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answer (see Currie & Wang, 2005; Fishbain, Cutler, Rosomoff, & Rosomoff, 1997).

Childhood physical, sexual and emotional abuse has been shown in numerous studies to be associated with chronic pain in adulthood (e.g., Hu, Link, McNaughton-Collins, Barry, & McKinlay, 2007; Imbierowicz & Egle, 2003; Lampe et al., 2000; Sansone, Pole, Dakroub, & Butler, 2006; Thomas, Moss-Morris, & Faquhar, 2006) and also with depressiveness (e.g., Aguilera et al., 2009; Karevold, Roysamb, Ystrom, & Mathiesen, 2009; Rubino, Nanni, Pozzi, & Siracusano, 2009; Schilling, Aseltine, & Gore, 2007).

The cognitive theory of depression proposes that the essential component of depression is the tendency to view the self, the future and the world in a dysfunctional, negative manner, which reflects an underlying theme of loss. The depressed individual's thinking is systematically biased in a negative direction. Idiosyncratic cognitive schemas are proposed as hypothetical structures, dysfunctional cognitive schemas that maintain the negatively biased view (Beck, Rush, Shaw, & Emery, 1979). Young (1990) introduced his early maladaptive schema (EMS) concept as an extension of the aforementioned but also substantiated his theory with the findings of Millon (1981) and Guidano and Liotti (1983). There are now 18 different EMSs grouped into five hypothesized schema domains (Young, Klosko, & Weishaar, 2003). Every domain represents one important part of the core needs of the child. Childhood neglect, maltreatment and abuse produce, e.g., EMSs like Abandonment/Instability (AB), Mistrust/Abuse (MA) or Emotional Deprivation (ED), which belong to the Disconnection and Rejection schema domain. Of the schema domains, some (Hoffart et al., 2005) or all (Dozois, Martin, & Bieling, 2009; Halvorsen et al., 2009) have predicted depression. Of the individual EMSs, depression has been associated with or predicted by Insufficient Self-Control/Self-Discipline (IS), Failure (FA), Dependence/Incompetence (DI), Defectiveness/Shame (DS) and AB (Baranoff, Oei, Cho, & Kwon, 2006; Glaser, Campbell, Calhoun, Bates, & Petrocelli, 2002; Harris & Curtin, 2002; Schmidt, Joiner, Young, & Telch, 1995; Welburn, Cristine, Dagg, Pontefract, & Jordan, 2002). The Social Isolation/Alienation (SI), DS and FA EMSs have been associated with suicidal ideation (Dutra, Callahan, Forman, Mendelsohn, & Herman, 2008). In the study by Cecero, Nelson, and Gillie (2004), MA, ED and DS EMSs were predicted by childhood emotional abuse, and ED and DS EMSs were predicted by childhood emotional neglect. Certain EMSs also predicted attachment styles (AB Preoccupied; SI and ED Dismissing; MA Fearful attachment style). However, all these studies are based on the earlier schema domain and EMS distribution (Lee, Taylor, & Dunn, 1999; Schmidt et al., 1995).

In spite of the high co-morbidity of chronic pain and depression and their similar risk factors in childhood, the

quality of the association between them is not definite. These 18 different EMSs depict extensively underlying psychic patterns and serve as a good opportunity to find covert processes and psychic shapes (latent factors), which provide the basis for how different patient groups rate their schemas. Exploratory factor analysis (EFA) offers a method to define these covert, latent factors. To the best of our knowledge, the second order latent factor structure of 18 EMSs has not yet been tested. According to what is known about the association between early adversities and chronic pain and depression and the way in which EMSs reflect childhood adversities, we find it appropriate to conduct this study. The aims of this paper are the following: (1) we ask if chronic pain patients show a latent factor structure different from the control participants and (2) we want to find out how these latent factors predict pain and depression.

## METHOD

### *Participants*

From six pain clinics in central and northern Finland, consecutive 18–64-year-old first-visit pain patients were recruited for this study during a period of 1 year (January 2004–2005). Patients with a primary psychotic disorder, a cognitive impairment or inability to complete questionnaires were excluded from the study. Sources of referral included primary health care and various medical specialists. The patients were informed in advance about the study protocol by letter. Every patient attending the pain clinic received the questionnaire by which the data were gathered. Of 318 eligible patients, 271 participated. All these patients were suffering from non-malignant, daily, chronic pain lasting 3 months or longer (International Association for the Study of Pain, 1986).

The control group was recruited from among the employees of the Raahe town administration ( $N = 918$ ; women  $n = 728$ ; men  $n = 190$ ). All the municipal officials were informed beforehand by electronic weekly bulletin that a control group for a chronic pain study was needed, and everyone would receive a questionnaire to complete within 1 month (March 2005). They were also informed that the study was based on total anonymity and free will. A total of 331 individuals participated in the study. The study protocol was approved by the ethical committee of the Northern Ostrobothnia Hospital District. Written informed consent was obtained from all participants.

### *Measures*

#### *Pain*

The pain questionnaire was developed for this study to collect information on demographic data (age, occupation, gender); pain localization (pain picture); the onset of the pain disease; the temporal quality of the pain; the

current pain intensity measured with two 10-cm Visual Analogue Scales (VAS; McDowell & Newell, 1996). On the first VAS (pain max), patients were asked to rate their maximal experienced pain (from 0 = 'no pain' to 10 = 'worst pain one can imagine') and on the second VAS (pain min), patients were asked to rate their minimal experienced pain (from 0 = 'no pain' to 10 = 'worst pain one can imagine'). Pain intensity was the mean of pain max and pain min.

### *Depression*

Depressiveness was assessed with the revised 21-item questionnaire, the Beck Depression Inventory, Version II (BDI-II; Beck, Steer, & Brown, 1996), which was also validated in the Finnish language (Beck, Steer, & Brown, 2004). All the items were self-rated from 0 to 3 and summed to get a score range from 0 to 63, with the higher values indicating more severe depressive symptoms. The results of the study by Harris and D'Eon (2008) supported the use of BDI-II for assessing depressive symptoms in both women and men with chronic pain.

### *EMS*

The Young Schema Questionnaire (YSQ) was developed to measure the activity of EMSs. There are currently several different versions (long versions: YSQ, 15 EMSs, 123 items [Young & Brown, 1989]; YSQ Long Form, 16 EMSs, 205 items [Young & Brown, 1994]; and YSQ Long Form, Third Edition [YSQ-L3], 18 EMSs, 232 items [Young & Brown, 2003b]; short versions: YSQ Short Form, 15 EMSs, 75 items [Young, 1998]; YSQ Short Form, Second Edition [YSQ-S2], 15 EMSs, 75 items [Young & Brown, 2003a]; and YSQ Short Form, Third Edition, 18 EMSs, 90 items [Young, 2005]) of the questionnaire. The factor structure of the YSQ has been approved in many different languages e.g., English, Korean, Dutch, Norwegian, Spanish and Finnish (Baranoff et al., 2006; Calvete, Estevez, Arroyabe, & Ruiz, 2005; Hoffart et al., 2005; Rijkeboer & Bergh, 2006; Saariaho, Saariaho, Karila, & Joukamaa, 2009; Schmidt et al., 1995). In the present study, the participants completed the YSQ Short Form-Extended (Saariaho et al., 2009). This includes the YSQ-S2 and also contains five Approval-Seeking/Recognition-Seeking (AS), five Negativity/Pessimism (NP) and five Punitiveness (PU) schema items from the YSQ-L3. It is a self-report, Likert-type questionnaire where a value of 1 means 'completely untrue of me' and a value of 6 means 'describes me perfectly'. The mean of every subscale is calculated, and higher values describe stronger schema valence and a more maladaptive core belief. The YSQ-S2-Extended was designed to assess 18 EMSs, namely Emotional Deprivation (ED), Abandonment/Instability (AB), Mistrust/Abuse (MA), Defectiveness/Shame (DS), Social Isolation/Alienation (SI), Dependence/Incompetence (DI), Vulnerability to Harm or Illness (VH),

Enmeshment/Undeveloped Self (EM), Failure (FA), Entitlement/Grandiosity (ET), Insufficient Self-Control/Self-Discipline (IS), Subjugation (SB), Self-Sacrifice (SS), Emotional Inhibition (EI), Unrelenting Standards/Hypercriticalness (US), Approval-Seeking/Recognition-Seeking (AS), Negativity/Pessimism (NP) and Punitiveness (PU). The reliability and 18-factor structure of the YSQ-S2-Extended in the Finnish language has been established (Saariaho et al., 2009). EMS and schema are henceforth used synonymously in this paper.

### *Data and Statistical Analysis*

#### *Inclusion Criteria and Missing Data Imputation*

Among the 271 pain patients and among the 331 control participants there were three and seven cases, respectively, with missing values of EMSs more than 10%, who were excluded from the study. The remaining cases with missing values ( $n = 4$  and  $n = 3$ , respectively) were treated with the expectation-maximization algorithm data imputation method [SPSS 16.0 (SPSS Inc., Chicago, IL, USA); Kline, 2004]. Thus 268 pain patients and 324 control participants with no missing EMS data were included for the analyses. The demographic data, pain descriptors and BDI-II scores of both groups are shown in Table 1.

#### *EFA: Principles for Factoring and Variable (EMS)*

##### *Inclusion and Exclusion Criteria*

We conducted principal component analysis (PCA) analysis with Varimax rotation on our control sample with the same 15 EMSs as those used in the study by Calvete et al. (2005). The analysis suggested a three-component, higher order structure, which was identical in the order of components, total variance explained and almost identical in component structure and cross-loadings compared with the data by Calvete et al. (2005). The only significant difference was that, although in both samples DS loaded on two components with  $>0.40$  loading, it loaded mainly on component one in our study and on component two in the study by Calvete et al. (2005). We deemed this to warrant a study with 18 EMSs as follows.

To explore the structure of the higher order latent factors (SF), 18 EMSs were subjected to EFA with principal axis factoring (PAF)—also called common factor analysis—and subjected to promax rotation. Oblique rotation (promax, kappa 4) was used as it could be expected that the EMS factors would correlate (e.g., Hoffart et al., 2005). Correlation matrices were used for the EFA. The subject-to-variable ratio was 15:1 and 18:1 in the pain patient and control groups, respectively. The following criteria were used as guidelines for the EFA (Costello & Osborne, 2005; Hatcher, 1994; Thompson, 2004): Cattell's Scree Test; Eigenvalue greater than 1.0; proportion of variance accounted for each factor more than 5%–10%; and interpretability criteria (at least three variables with significant

Table 1. Demographic data, pain and BDI-II variables of chronic pain patients and control participants

Variable	Pain patient group ( <i>n</i> = 268)		Control group ( <i>n</i> = 324)		<i>p</i> value
	Mean	SD	Mean	SD	
Age	47.1	9.3	47.3	9.5	0.84 <sup>†</sup>
Gender (Male/female)	125/143		40/277 <sup>‡</sup>		<0.001 <sup>†</sup>
Duration of education	11.1	1.6	13.2	2.9	<0.001 <sup>†</sup>
Pain intensity (VAS)	5.9	1.2	2.8	2.0	<0.001 <sup>§</sup>
Number of pain sites	2.1	1.3	1.4	1.2	<0.001 <sup>§</sup>
Pain duration in years	9.3	8.8	2.4	2.4	<0.001 <sup>§</sup>
BDI-II	15.6	10.1	7.2	6.7	<0.001 <sup>§</sup>

<sup>†</sup>Student's *t*-test.

<sup>‡</sup>Chi-square test.

<sup>§</sup>Mann-Whitney U-test.

<sup>¶</sup>Gender not mentioned in seven cases.

VAS = visual analogue scale. BDI-II = Beck Depression Inventory, Version II. SD = standard deviation.

loadings on each retained factor; variables that load on a given factor share some conceptual meaning and variables loading on different factors seem to be measuring different constructs; and the rotated factor demonstrates simple structure). All EMSs that failed to load above |0.4| (pattern coefficient) on any factors or that loaded on two or more factors above |0.4| were deleted. When the final factor structure was reached, the SF scores were computed for subsequent regression analyses with *save regression scores* command (SPSS 16.0) according to Thompson (2004).

### Linear Regression Analysis

Linear regression analyses were used to explore how SF predict pain intensity and depression. To measure and detect a linear relationship between all variables, *a priori*, both the dependent and independent variables were plotted on a scatterplot and visually analysed for linearity. Whenever the bivariate distribution between the two variables is not absolutely linear, the *r* between those variables will be an underestimate of the magnitude of their relationship (Cohen, Cohen, West, & Aiken, 2003). After the regression analyses, the residuals were saved and plotted against independent and predicted variables and their linear distribution was examined. To check for homoscedasticity the scattering of residuals was examined with dependent and predictor values. The normal distribution of the residuals was reviewed to approve the model (Cohen et al., 2003).

## RESULTS

### EFA

In both groups, the structure matrix suggested a similar factor structure as the pattern matrix, although with lower

pattern matrix coefficients, the structure matrix coefficients also showed a rather strong correlation with the other SF (Table 2). The least diagonals on the anti-image correlation matrix were 0.885 and 0.807 in the pain patient and control groups, respectively. The SF structure was not identical in the two groups.

The factor structure in the pain patient group comprised two SFs and the total variance explained was 58.9%. The correlation between these two SFs was 0.71. SF1 comprised all EMSs belonging to the Disconnection and Rejection schema domain (ED, AB, MA, SI, DS) and also all EMSs belonging to the Impaired Autonomy and Performance schema domain (FA, EM, DI, VH). From the Other-Directedness schema domain there was SB schema; from the Overvigilance and Inhibition schema domain there was EI schema; and from the Impaired Limits schema domain there was IS schema. SF2 consisted of all the remaining EMSs, namely SS, AS (Other-Directedness schema domain); US, PU, NP (Overvigilance and Inhibition schema domain); and ET (Impaired Limits schema domain). We read all the items of the schemas with the highest pattern coefficients and labelled them SF1 = *Loser* (shameful and defective, socially isolated, failure, emotionally inhibited and deprived, submissive and resigned) and SF2 = *Encumbered* (high standards, punitive if standards were not met, approval seeking and self-sacrificing), respectively.

In the control group, the results comprised three SFs and the total variance explained was 60.5%. The correlation between these three SFs was: SF1–SF2 *r* = 0.54; SF1–SF3 *r* = 0.66; and SF2–SF3 *r* = 0.47. SF1 consisted of all EMSs belonging to the Impaired Autonomy and Performance schema domain (FA, EM, DI, VH), and DS (Disconnection and Rejection schema domain), NP (Overvigilance and Inhibition schema domain), SB (Other



Table 2. Principal axis factoring (promax rotation) of the early maladaptive schemas (EMs) in pain patient and control groups with 2 and 3 higher order schema factors (SFs) respectively

EMS	Pain patient group SF						Control group SF					
	1			2			1			2		
	p	s	h <sup>2</sup>	p	s	h <sup>2</sup>	p	s	h <sup>2</sup>	p	s	h <sup>2</sup>
Emotional Deprivation	0.797	0.746	0.559	-0.072	0.498	0.559	0.107	0.542	0.601	-0.120	0.294	0.754
Abandonment/Instability	0.441	0.671	0.501	0.322	0.637	0.501	0.395	0.610	0.461	0.150	0.461	0.200
Mistrust/Abuse	0.605	0.729	0.546	0.174	0.606	0.546	0.170	0.608	0.300	0.300	0.587	0.410
Social Isolation/Alienation	0.867	0.849	0.722	-0.025	0.594	0.722	0.065	0.599	0.044	0.044	0.441	0.766
Defectiveness/Shame	0.938	0.865	0.753	-0.102	0.568	0.753	0.620	0.774	0.359	-0.149	0.359	0.355
Failure	0.895	0.773	0.612	-0.170	0.469	0.612	0.874	0.779	0.325	-0.144	0.325	-0.024
Dependence/Incompetence	0.802	0.760	0.580	-0.059	0.514	0.580	0.778	0.783	0.391	-0.066	0.391	0.063
Vulnerability to Harm or Illness	0.456	0.668	0.489	0.297	0.623	0.489	0.603	0.678	0.479	0.154	0.479	-0.015
Enmeshment/Undeveloped Self	0.527	0.571	0.328	0.062	0.438	0.328	0.482	0.603	0.303	-0.079	0.303	0.246
Subjugation	0.897	0.825	0.685	-0.101	0.540	0.685	0.567	0.755	0.386	-0.097	0.386	0.362
Self-Sacrifice	-0.136	0.266	0.227	0.564	0.466	0.227	-0.134	0.146	0.440	0.517	0.440	-0.005
Emotional Inhibition	0.618	0.691	0.483	0.102	0.544	0.483	0.087	0.507	0.450	0.171	0.450	0.489
Unrelenting Standards/Hypercriticalness	-0.197	0.345	0.401	0.759	0.618	0.401	-0.351	0.267	0.815	0.815	0.742	0.254
Entitlement/Grandiosity	0.287	0.624	0.499	0.473	0.677	0.499	0.064	0.435	0.472	0.472	0.586	0.167
Insufficient Self-Control/Self-Discipline	0.447	0.661	0.481	0.300	0.619	0.481	0.434	0.602	0.280	0.280	0.529	0.021
Approval-Seeking/Recognition-Seeking	-0.025	0.474	0.463	0.698	0.681	0.463	0.276	0.441	0.667	0.667	0.676	-0.303
Negativity/Pessimism	0.391	0.735	0.655	0.482	0.761	0.655	0.505	0.688	0.375	0.375	0.636	-0.035
Punitiveness	0.212	0.683	0.678	0.659	0.810	0.678	0.179	0.498	0.641	0.641	0.716	-0.050
Eigenvalue	9.13			1.48			7.36			1.85		1.08
	Kaiser-Meyer-Olkin 0.943						Kaiser-Meyer-Olkin 0.921					
	Bartlett's test of sphericity <0.001						Bartlett's test of sphericity <0.001					
	Total variance explained 58.9%						Total variance explained 60.5%					
	Rotation converged in three iterations.						Rotation converged in seven iterations.					

p = pattern coefficient; s = structure coefficient; h<sup>2</sup> = communalities.

Directedness) and IS schemas (Impaired Limits schema domain). SF2 consisted of PU, US (Overvigilance and Inhibition schema domain), SS, AS (Other Directedness) and ET schemas (Impaired Limits). SF3 comprised SI, ED, MA (Disconnection and Rejection schema domain) and EI schemas (Overvigilance and Inhibition schema domain). The AB EMS (Disconnection and Rejection schema domain) fell between SF1 and SF3 and was excluded from the analyses. We read all the items of the schemas with the highest pattern coefficients and labelled them as SF1 = *Endangered* (failure, dependent, pessimistic, defective and vulnerable), SF2 = *Encumbered* (high standards, punitive if standards not met, approval seeking and self-sacrificing) and SF3 = *Lonely* (socially isolated, emotionally deprived, mistrusting and emotionally inhibited), respectively.

### Linear Regression Analysis

In the first regression analysis we used pain intensity as the dependent variable, and in the second analysis we used the BDI-II as the dependent variable and SF1–2 (chronic pain patients) or SF1–3 (control participants) as the independent, predictive variables. *A priori*, as the BDI-II was plotted against SF score 1 (chronic pain patients) the relationship was not absolutely linear, we made a logarithmic correction ( $= \log_{10}[\text{SF score } 1 + 2]$ ). After that, their relationship was also linear. The results of the regression analyses where pain intensity was the dependent variable did not show any statistically significant predictive value of SF1–2 (chronic pain patients) or SF1–3 (control participants) on pain. The results of the regression analyses predicting BDI-II are shown in Table 3. In the pain patient group, SF1 predicted BDI-II ( $\beta = 0.648, t = 9.41, p < 0.001$ ). The variation of the model explained the variation of BDI-II 55% (confidence interval of 95% [CI95] 46%–64%). In the control group, the standardized regression coefficient was highest for SF1 ( $\beta = 0.294, t = 3.89, p < 0.001$ ), then for SF3 ( $\beta = 0.265, t = 3.67, p = 0.001$ ). In the control group, the variation of the model explained the variation of BDI-II 31% (CI95 25%–37%). After the regression analyses, the saved residuals were plotted against the saved predicted variables and independent variables to confirm a linear relationship and homoscedasticity. The normality of the residuals was also checked. No victimization of the aforementioned was detected.

### DISCUSSION

The pain patient and control groups differed in their latent, higher order SF structure of 18 EMS. Chronic pain patients had only two latent factors which showed (1) shameful, defective, socially isolated, failure and emotionally deprived and inhibited patterns and (2) high standards, punitive, approval seeking, self-sacrificing and

Table 3. Linear regression analyses (enter method) of SF scores predicting depression (BDI-II) in pain patient and control samples

Independent variable	Pain patient group					Control group				
	$\beta$	$R^2$	CI95 for $R^2$	$t$	$F$	$p$ value	df	Independent variable	$\beta$	$R^2$
			Upper	Lower						
SF score 1 <sup>†</sup>	0.648	0.55	0.64	0.46	164.0	<0.001	2, 265	SF score 1	0.294	0.31
SF score 2	0.115				9.41	<0.001		SF score 2	0.049	
					1.67	0.097		SF score 3	0.265	

Note: <sup>†</sup> $\log_{10}$  (schema factor score  $1 + 2$ ).

$\beta$  = standardized regression coefficient;  $R^2$  = coefficient of determination; CI95 for  $R^2$  = confidence interval of 95% for  $R^2$ ;  $F$  =  $F$ -value;  $t$  = Student's  $t$ -value; df = degrees of freedom.

pessimistic patterns. The first SF predicted over half (55%) of the depression of chronic pain patients. The control group consisted of three SFs, of which the first and third factors predicted 31% of depression. In neither group did any SF predict pain intensity. To the best of our knowledge, this is the first study to measure the latent, higher order factor structure based on 18 EMSs.

Chronic pain patients had a rather parsimonious higher order SF structure, which consisted of two strongly correlated factors. The first and larger SF1 consisted of all EMSs belonging to the Disconnection and Rejection and Impaired Autonomy and Performance schema domains and of SB, EI and IS EMSs. The highest loadings belonged to DS, SB, FA, SI, DI and ED schemas in that order of magnitude. The individual items (schema questionnaire) of the respective EMSs share a picture of a patient with pain, who feels defective (incapable of functioning) and, for that reason, shameful and isolated, subjugated (because of the pain) to be dependent on others and (originating from childhood) without nurture, therefore we labelled it *Loser*.

SF2 in chronic pain patients consisted of US, AS, PU, SS, NP and ET EMSs in that order of magnitude. SS and US EMSs were shown to be the most frequent active schemas among chronic pain patients (Saariaho, Saariaho, Karila, & Joukamaa, 2010). In clinical practice (A.S. and T.S.), this gives a rather typical clinical picture of a chronic pain patient, who is demanding (for him/herself), seeking approval almost resignedly and self-sacrificingly and punitive on him/herself if unsuccessful, and accordingly we labelled this *Encumbered*. Van Houdenhove, Neerinx, Onghena, Lysens and Vertommen (2001) studied the so-called *action-proneness* (overactive lifestyle, pursuit for achievement, approval and perfection) in fibromyalgia and chronic fatigue patients and suggested that it could be a predisposing, initiating and perpetuating factor in those syndromes. Action-proneness strongly resembles the content of SF2 (*Encumbered*).

We ask if these two SFs are reciprocal, [i.e., 'a stable pattern of interaction originating in relationships with caretakers in early life, determining current patterns of relationships with others and self-management' (Ryle & Kerr, 2002, p. 220)]. According to schema theory (Young et al., 2003), ED schema may go unrecognized and may emerge in conditional schemas (SS, US, AS) and even show up in PU schema. We assume that SF2 can be the pain predisposing and maintaining factor, which e.g., prevents the pain patient from relaxing and setting limits. In agreement with Van Houdenhove et al. (2001) we conclude that the pain patient surpasses the limits, and when this continues for years his/her body becomes painful. Then he/she succumbs to the core beliefs of SF1 (*Loser*).

The control participants showed a three-factor pattern of the higher order SF. SF1 (*Endangered*) consisted of all

the EMSs belonging to the Impaired Autonomy and Performance schema domain, but also of DS, NP, SB and IS EMSs. SF2 (*Encumbered*) consisted of US, AS, PU, SS and ET schemas. SF3 (*Lonely*) consisted of ED, SI and MA EMSs from the Disconnection and Rejection schema domain and from EI EMS. AB EMS did not load adequately on any factors.

All higher order EFA and CFA studies so far have been conducted with older versions of YSQs, which consisted mainly of 15 or 16 EMSs except one EFA study (Unoka, Tölgyes, & Czobor, 2007) with 19 EMSs. However, the results of that study did not yield the factor structure presented. The factor structure of chronic pain patients comprised two factors and no EMSs needed to be excluded. It bore no resemblance to earlier studies and was most parsimonious. The first EFA study with the largest sample size (Schmidt et al., 1995; 1,129 students) consisted of three higher order factors as did the factor structure of our control sample. There were eight EMSs divided into factors similar to those in our study. After their study, some of the EMSs have changed names or no longer exist, making comparison difficult. The control sample of our study bore the strongest resemblance of the EFA studies to the study by Lee et al. (1999; Australian clinical sample,  $n = 433$ , mean age = 39 years), where 3 factors contained mainly the same EMSs (11 EMSs in similar factors). However, they had a fourth factor, which consisted of Fear of Loss of Control and ET schemas; the former no longer belongs to the YSQ. In the study by Cecero et al. (2004; students,  $n = 292$ ) there were 10 (one inverted) EMSs in factors similar to those in our control group, but they, too, had a fourth factor consisting solely of ET schema. The sample-to-variable ratio varied across EFA studies and was greatest (87:1) in the study by Schmidt et al. (1995). There were also two CFA studies of higher order SF by which Hoffart et al. (2005; clinical sample,  $n = 888$ , mean age <40 years) confirmed the factor structure presented by Lee et al. (1999). In the other study (Calvete et al., 2005; students,  $n = 407$ ), a three-factor model was suggested, and the first and second factors shared all EMSs, which were included in the first factor (*Loser*) of our pain patients. The third factor in that study consisted of the same EMSs as the SF2 of pain patients (PU, AS, NP EMSs were not included in their study because of the use of YSQ-S2). When comparing the three-factor structure of Calvete et al. (2005) with the three-factor structure of our control group, the resemblance was the most striking of all the aforementioned studies. As the study by Calvete et al. (2005) consisted of 15 contemporary EMSs also included in our study, we made an EFA (PCA and Varimax rotation) with the same 15 EMSs to ensure the validity of our data. The analysis suggested a three-component higher order structure in the control sample, which was identical in the order of components and total variance explained and almost identical in

component structure and cross-loadings compared with the data by Calvete et al. (2005). This suggested a fairly uniform higher order SF structure in different non-clinical samples and age groups in different nations. Both samples in our study consisted of the oldest age groups.

The EFA method (PAF) and the rotation (oblique) used in this study were the same as in the study by Cecero et al. (2004). In the studies by Schmidt et al. (1995) and Lee et al. (1999), the method used was PCA and the rotation method orthogonal (Varimax). According to the strict norms, PCA is not a pure factor analysis method (Hatcher, 1994); however, when the number of measured variables increases, principal axes factors and principal components tend to be more and more similar (Ogasawara, 2000). PCA is a method to linearly combine observed variables into a component and is best suited to selecting and reducing items from a larger item pattern. PAF is a true factoring method and as such is better suited to seeking latent, underlying factors that are responsible for the covariation of the data, which was the first focus of our study. In the CFA of Hoffart et al. (2005), it was shown that the higher order factors (schema domains) correlated to a significant degree ( $r = 0.92$  between Impaired Autonomy and Disconnection). We therefore preferred to use oblique rotation. Thus, despite the previous tradition of PCA and orthogonal rotation in EMS research, we used the aforementioned method. Unfortunately, our two different populations and sample sizes did not allow us to use a split sample method and both EFA and CFA.

To explore how these SFs predict pain, we conducted separate linear regression analyses for both samples. Pain intensity was the dependent variable and SFs were the predictors. In both groups, no SF predicted pain intensity. There may be some explanations for this. First, the chronic pain patients had suffered pain, on average, for 9 years, so we did not have access to the beginning of their pain disease. In that case it would have been plausible to see some association between pain intensity and SF1–3 in the control group, but no such association was found. However, we must remember that the latent factor structure between the groups was different, so they probably represented two groups with different underlying psychic structure. Maybe pain intensity and SF valences are not parallel processes. One way to ascertain their linear relationship would be to use longitudinal analysis. Second, we conjecture, pain intensity is a way to convey the suffering to get the best relief for the longstanding severe pain on the first visit to the pain clinic. Third, Grzesiak (1994) distinguished chronic pain syndrome patients from individuals with chronic persistent pain as the ones who do not cope well and succumb to a broad array of biopsychosocial dysfunctions. Pain intensity (VAS) may be too unspecific and unsophisticated a tool for measuring the association between pain disease and early adversities and warrants, e.g., the use of pain disability instead of

pain intensity as the indicator. However, the items in pain disability indicators have interface with the instruments measuring depression. Altogether, we believe in accordance with Van Houdenhove et al. (*action-proneness*; 2001) that SF2 (*Encumbered*) has an influence on the resumption of pain, although this could not be shown in this study.

To ascertain how these SFs predict depressiveness, we conducted separate linear regression analyses for both groups with depression (BDI-II) as a dependent variable and SFs as independent variables. In the pain patient group, SF1 (*Loser*) exclusively predicted depression. The effect size was 55% and thus a little larger than in the study with a clinical sample (Hoffart et al., 2005), where Impaired Autonomy and Disconnection schema domains predicted depressiveness (53%). When attention was paid to the individual EMSs, they were identical with our pain patient sample. This supports the significant value of Disconnection and Rejection and Impaired Autonomy and Performance schema domains as predisposing factors for depression. The data suggests a salient role of early emotional trauma in the development of depression in chronic pain patients.

In the control group, depressiveness was predicted by SFs 1 (*Endangered*) and 3 (*Lonely*), and the model explained the variance of depression (31%). The effect size of SF1 and 3 was almost equal. All EMSs from Impaired Autonomy and Performance schema domain and DS, NP, SB and IS schemas were in SF1. When attention was paid to the highest loading EMSs in that factor, it seemed that experiences of failure, dependency, incompetence, defectiveness, shame, negativity and vulnerability mostly explained depression. It bore a strong resemblance to the cognitive triad (Beck et al., 1979), namely FA, DI, DS and EM schemas reflecting a negative view of one's self, and NP and VH schemas reflecting a negative view of the future.

From the stress-diathesis point of view (Banks & Kerns, 1996), childhood trauma (*Loser* in chronic pain patients) may be seen as a psychological diathesis and common to both chronic pain and depression. SF1 and 2 are two related and interacting vulnerability factors for the development of behaviour leading to pain. Pain and the consequent harm in everyday life will serve as a stressor for depression.

The chronic pain patient sample was collected from several pain clinics from different types of public hospitals in Finland and the proportion of patients declining to participate was low. Both groups were also large enough to satisfy sufficient sample sizes for the analytical methods used. The age range was the highest so far. The limitations in this study lie in the self-report data gathering. We assume that the higher order EMS structure of our pain patient sample reflects the characteristics of chronic pain patients in Finland, and other studies from different cultural backgrounds are needed. These findings call for



qualitative studies of pain patients' stories and speech for a better EMS analysis. The control group differed significantly from the pain patient group in gender and length of education. However, Rijkeboer, Bergh, and Bout (2005) found no bias or corresponding tendency in different gender or education levels. This study was cross-sectional and thus unable to empirically define the temporal cause-and-effect relationships.

The chronic pain patient group showed a parsimonious higher order SF structure. The first factor reflected a *Loser* role, while the second factor reflected an overcompensator's role (*Encumbered*) for the first one, advocating a reciprocal role of these two factors. The control sample showed a three-factor structure with a lot of similarities to earlier studies. However, this was the first study to use the present-day 18 EMS structure for analyses and as such is unsuitable for full comparison with earlier ones. The first SF (*Loser*) predicted over half of the depression of chronic pain patients. In the control group the first and third SF together predicted 31% of depression. From the theoretical point of view the data support the view that early adversities predispose chronic pain patients to depression. From the therapeutic point of view, this factor analysis gives us many opportunities to treat pain patients. First and foremost, we should be able to support the ashamed, failure, dependent, incompetent, negative and vulnerable ones to feel dignity. At the same time we should calm down the '*Encumbered*' ones to get them relaxed and their suffering bodies to heal. We should also consider schema therapy for the treatment of depressive chronic pain patients.

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## Original Article

### Early maladaptive schema factors, pain intensity, depressiveness and pain disability: An analysis of biopsychosocial models of pain.

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## Abstract

**Purpose:** To test different biopsychosocial models of pain within two different samples.

**Method:** Early maladaptive schemas, pain intensity, depressiveness and pain disability were assessed using questionnaire data from 271 first visit pain patients and 276 municipal employees as controls. Exploratory factor analysis was used as the early maladaptive schema factor extraction method and path analysis as the model specification and estimation method.

**Results:** Cross-sectionally, early maladaptive schema factors were predictors of depressiveness in both groups. The effect size of depressiveness on pain disability was eleven times that of the pain intensity in the pain patient group. The situation was opposite in the control group, where effect size of pain intensity was 5.6 times that of depressiveness. In subgroups of pain duration, the effect size of pain intensity on pain disability became insignificant when pain duration was more than two years in pain patients.

**Conclusions:** The study supported the importance of early emotional adversities in predicting depressiveness especially among pain patients. Depressiveness was the main predictor of pain disability in the pain patient group and as the pain duration increased, the significance of pain intensity on disability vanished. Pain intensity was the main predictor of pain disability in the control group.

## Keywords

Early maladaptive schema, pain, disability, depression, biopsychosocial

## Implications for rehabilitation

- to decrease disability among chronic pain patients is mainly to treat their depressiveness
- to decrease disability among people with mild pain is mainly to treat their pain intensity
- the focus of psychotherapy among depressive chronic pain patients should be a pattern of inadequacy, shame, submission, failure, social isolation and dependence



## Introduction

Chronic pain is a burden [1]. The experience of chronic pain can both arise from an interdependent set of biomedical, psychosocial and behavioral factors and in its turn affect these biopsychosocial factors [2,3]. The term 'biopsychosocial' can be defined as 'the observation that biological, psychological and social factors are interwoven in the context of chronic disease' [4]. Some of chronic pain patients become disabled. Grzesiak [5] distinguished chronic pain syndrome patients from individuals with chronic persistent pain as those who do not cope well and succumb to a broad array of biopsychosocial dysfunctions. Pain disability is associated with numerous biological factors e.g. age [6], male gender [7], pain severity [8,9], pain distribution [9]; psychological factors e.g. distress [10], fear avoidance [11], low Self-Efficacy beliefs [12,13], depression [6,14]; social factors e.g. a low grade of education [15], poor social support [16], high prior sick listing [17,18] and injury compensation [19] and behavioural factors e.g. sleep disturbances [17,20,21], passive coping strategies [22] and smoking [20].

The importance of emotional disturbances and early traumatic experiences in the subsequent development and maintenance of chronic pain [23-27], pain disability [28,29], and depression [30-33] has been a topic of much scientific interest during the last two decades and seems to be increasing when neuroimaging has revealed changes in many emotionally important sites of CNS among chronic pain patients [34]. Beck et al. [35] using the schema concept proposed that early experiences provide the basis for forming the negative concepts of one's self, the future and the external world - cognitive triad - which is associated with depression. According to schema theory [36] early childhood experiences lay the foundation for an individual's patterns and models of the self, others and the world. In adverse life situations, these patterns become maladaptive, i.e. dysfunctional, pervasive and cause suffering. These patterns are called Early Maladaptive Schemas (EMS). There are 18 different EMSs grouped into 5 hypothesized schema domains [37]. Childhood neglect, adversities, maltreatment and abuse produce, for example, EMSs like Abandonment/Instability, Mistrust/ Abuse or Emotional Deprivation which belong to Disconnection & Rejection schema domain. EMSs induce depression [38]. Of the schema domains, some [39] or all [40,41] have predicted depression. In chronic pain patients, a schema factor comprising the features of shame, failure, dependency, incompetency and vulnerability has been associated with depressiveness [42].

The prevalence of major depression among chronic pain patients varies from 1.5% to 100% depending on the context (population survey, primary care, pain clinic) and the prevalence of pain among depressive patients varies between 5% and 100% [43]. The causality and temporal association of pain and depression have been a focus of numerous studies. Magni et al. [44] suggested that depression promotes pain and pain promotes depression. Fishbain et al. [45] tentatively suggested that chronic pain precedes depression, hence depression is the consequence of chronic pain. However, Currie and Wang [46] in their longitudinal study concluded that major depression increases the risk for a pain free individual to develop a future chronic pain almost three times, hence depression is an antecedent risk factor for chronic pain.

Structural equation modeling (SEM), path-analysis and hierarchical regression analysis studies of pain models have in cross-sectional and longitudinal designs supported pain intensity [47-51], pain disability [14,52-55] and depression [7,48,54,56] as the 'end states'. The role of early maltreatment or emotional adversities has not been addressed in any of these studies.

The experience of over 8000 pain patient visits has given the authors (A.S. and T.S.) an impression that depression has played a major part in the development of pain disability. However, in their narratives of pain, patients almost exclusively emphasize the role of severe pain in causing pain disability and depression. The aim of this study is to test different biopsychosocial models of pain in a cross-sectional design within a pain patient sample and a control group. We will use the path-analysis method (Lisrel-analysis) to investigate 1) how pain intensity, pain disability, early maladaptive schema factors and depressiveness are related together separately in the pain patient and control samples and 2) if the duration of pain has an effect on the relationship between these variables in the pain patient group. Based on the aforementioned earlier studies, we assume that early maladaptive schema factors predict depressiveness [39-42] and that pain disability is the 'end state' [15,22,57-62].

## Method

### Participants

From six pain clinics in central and northern Finland consecutive 18 – 64 year old first visit pain patients were recruited for this study during a period of one year (January 2004-2005). Sources of referral included primary health care and various medical specialists. The patients were informed in advance about the study protocol by letter. Every patient attending the pain clinic received the questionnaire used for data collection. Of 318 eligible patients, 271 participated (men n=127, women n=144). All these patients were suffering from non-malignant, daily, chronic pain lasting 3 months or longer [63]. Patients reported the sites of pain as follows: head and face 13%, neck and shoulder 52%, low back pain 68%, extremity 44%, thorax 13% and abdominal pain 23%.

The whole population of employees of Raahe town administration (n=918; men n=190; women n=728) was asked to take part as a control group to a pain study. All were informed beforehand by electronic weekly bulletin that a control group for a pain study was needed and that everyone would receive a questionnaire to complete within one month (March 2005). In attempting to match the groups the inclusion criterion in the control group was the age of 18 - 64 years. They were also informed that the study was based on total anonymity and free will. 331 employees (36%) completed the questionnaire and of those there were 55 (17%) cases without pain and they were excluded from the analyses. The remaining 276 control participants in the analyses reported the sites of pain as follows: head and face 21%, neck and shoulder 44%, low back pain 38%, extremity 53%, thorax 7% and abdominal pain 8%.

The study protocol was approved by the ethical committee of the Northern Ostrobothnia Hospital District. Written informed consent was obtained from all participants.

### Measures

#### Pain intensity assessment

The pain intensity was measured with two 10-cm Visual Analogue Scales (VAS) [64]. On the first VAS (pain max) patients were asked to rate their maximal current experienced pain (0= “no pain” to 10= “worst pain one can imagine”) and on the second VAS (pain min) their minimal current experienced pain (0= “no pain” to 10= “worst pain one can imagine”). Pain intensity was the mean of pain max and pain min. The reliability of the VAS has been established [65-67].

#### Pain disability assessment

The Pain Disability Scale (PDS) was developed for this study. It is a 9-item self-report scale consisting of 7 direct statements: “My pain is disturbing my sleep”, “... my hobbies”, “... my sex life”, “... my work”, “... my ability to move”, “... my economy”, “... my social contacts”, and 2 inverted statements: “I can enjoy life despite my pain”, “I can control my pain”. All the items were self-reported on a Likert-type 0-3 scale: 0 = not at all; 1 = to some extent; 2 = significantly; 3 = very much. The total score (range 0-27) reflects the overall level of pain disability. A score of 0-4

indicates ‘no disability’, a score of 5-13 ‘mild disability’, a score of 14-22 ‘remarkable disability’ and a score of 23-27 ‘severe disability’. The Cronbach’s alphas for the PDS scales were 0.83 in the pain patient group and 0.89 in the control group.

The Pain Disability Scale (PDS) in this study was based on a pain disability scale used in most of the pain clinics in northern Finland. The Pain Disability Index (PDI) [68,69] is a reliable measure of pain disability [70,71]. Culturally and geographically, however, the study populations lived in a rather different atmosphere than where the PDI was developed and tested (St. Louis, USA). Thus, we felt obligated to make a pilot study with 103 pain clinic outpatients (A.S. and T.S., unpublished data). The pain patients perceived strange expressions in items #1 (e.g. driving the children to school), #3 (e.g. parties, theater, concerts, dining out), #4 (e.g. housewife or volunteer worker) and #7 (Life-Support Activity) in PDI. The correlation between PDS and PDI was high ( $r=.81$ ) and both PDS and PDI were strongly associated with BDI-II ( $r=.56$  and  $r=.58$ , respectively) and pain intensity (VAS,  $r=.62$  and  $r=.62$ , respectively). The results of this pilot data supported the use of PDS in this cultural setting to estimate pain disability.

### **Depression assessment**

Depressiveness was assessed with the revised 21-item questionnaire, the Beck Depression Inventory - Second Edition (BDI-II) [72] also validated in Finnish language [73]. All the items were self rated from 0 to 3 and summed to obtain a score range from 0 to 63 with higher values indicating more severe depressive symptoms. A score of 0-13 indicates minimal depressiveness (the individual faces normal ‘ups and downs’), a score of 14-19 indicates mild, a score of 20-28 moderate and a score of 29-63 severe depressive symptoms [72]. The results of the study by Harris and D'Eon [74] supported the use of BDI-II for assessing depressive symptoms in both women and men with chronic pain.

### **Early Maladaptive Schema (EMS) assessment**

The participants completed the Finnish version of the Young Schema Questionnaire - short form (YSQ-S2-extended; 90 items, 18 EMSs) [75]. A value of 1 means “Completely untrue of me” and a value of 6 means “Describes me perfectly”. The mean of every subscale is calculated and higher values describe stronger schema valence and a more maladaptive core belief. The YSQ-S2-extended was designed to assess 18 EMSs under 5 schema domains (table 1). The Cronbach's alphas for the individual EMS subscales varied between 0.94 and 0.79 in the pain patient group and between 0.94 and 0.81 in the control group. The construct validity and reliability of the YSQ-S2 [76] have been shown to be good [77,78]. The reliability and the 18-factor structure of the YSQ-S2-extended in Finnish language has been established [75].

[Insert table 1 about here](#)

## **Data and statistical analysis**

### **Inclusion criteria and missing data imputation**

Among the controls there were 5 and among the pain patients 3 cases with missing values of EMSs more than 10% and they were excluded from the study. The remaining cases with missing values (n=2 in controls, n=4 in pain patients) were treated with expectation-maximization algorithm data imputation method (SPSS 16.0; SPSS, Chicago, IL) [79; pp. 52-6]. Thus, there were 271 control participants and 268 pain patients for the analyses. The baseline characteristics, pain descriptions and BDI-II scores of both groups are shown in table 2.

**Insert table 2 about here**

To test the effect of duration of pain on the final pain model, the pain patient sample was data based grouped as follows: subgroup 1: Sixty eight pain patients with the shortest duration of pain (0.25-2 years); subgroup 2: Sixty eight pain patients with a pain duration between 2.5-6 years and subgroup 3: Sixty eight pain patients with the longest duration of pain (more than thirteen years). The mean age was significantly higher in subgroup 3 than subgroups 1 and 2 (51years vs 45years). The number of pain sites was significantly higher in subgroup 3 than subgroup 1 (2.4 vs 1.8). Pain disability scale score was also significantly higher in subgroup 3 than subgroup 2 (17.8 vs 15.4). The length of education, mean pain intensity, BDI-II score and male/female ratio did not differ between the subgroups.

### **Exploratory factor analysis; Principles for factoring and variable (EMS) inclusion and exclusion criteria**

To find out latent factors emerging in this kind of chronic pain entity, we performed exploratory factor analysis (EFA) instead of using CFA with five hypothesised schema domains. To explore the structure of the higher order latent factors (schema factors=SF) 18 EMSs were subjected to EFA with principal axis factoring (PAF), also called common factor analysis, and to promax rotation. Oblique rotation (promax, kappa 4) was used as it could be expected that the EMS factors would correlate [39]. Correlation matrices were used for the EFA. The subject to variable ratio was 15:1 in both groups. The following criteria were used as guidelines for the EFA [80-82]: Cattell's Scree Test, Eigenvalue greater than 1.0, proportion of variance accounted for each factor more than 5%-10% and interpretability criteria (at least three variables with significant loadings on each retained factor, variables that load on a given factor share some conceptual meaning and variables loading on different factors seem to measure different constructs, and the rotated factor demonstrates simple structure). All EMSs that failed to load above |0.4| (pattern coefficient) on any factor or loaded on two or more factors above |0.4| were deleted. When the final factor structure was reached, the schema factor scores were computed for the subsequent path analyses with '*save regression scores*' command (SPSS 16.0) according to Thompson [81].

### **Model specification, identification and modification**

All models are overidentified and the degrees of freedom (df) vary from 1 to 6. The models in both groups were further modified for a possible more parsimonious resolution [81; pp. 70-1] and when

attained, the model with the least Minimum Akaike Information Criterion (MAIC [88]) was chosen. Minor modifications of the hypothesized models were allowed as long as the direction of paths was not changed, and they were acceptable from a theoretical point of view. As a final step, when the final path model is selected, Kline suggests ([79]; pp.153-156) an 'equivalent model consideration'. Thus, a different configuration of paths among the same observed variables should be tested to rule out any other possible model. The verbs cause and predict and the word causality in this context must be understood mainly as statistical terms and should be used cautiously [79; pp. 93-5].

### **Model #1**

This model is adopted from the narratives of chronic pain patients. The basic structure of this model is similar to the study by Arnstein [52], where pain intensity predicts pain disability and depression which in turn also predicts pain disability. Arnstein's model also included Self-Efficacy beliefs which were not measured in our study. The schema factors (SF) are included in our model to predict depressiveness.

### **Model #2**

This model is based on the experience working with chronic pain patients. In this model, depressiveness predicts pain intensity and pain disability. Pain intensity also predicts pain disability. The schema factors (SF) are included in our model to predict depressiveness.

### **Model estimation and statistical analyses**

All the variables used in the path analyses had normal distribution in skewness and kurtosis and when plotted showed visual normality after normal score command (Preliis 2.80). Although the data did not quite reach multinormality in the control group, we used maximum likelihood (ML) as the path analysis estimation method. ML attains optimal asymptotic properties, namely, that the estimates are normally distributed, unbiased and efficient. First, the slight lack of multinormality in the control group data may underestimate standard errors and overestimate the likelihood ratio of chi-square statistics. It does not, however, affect the parameter estimates [83]. Second, we focused on the different models in the same group, as group comparisons between the pain patient and control groups were not possible because of a different schema factor structure. On the basis of the aforementioned we used ML estimation method. We used a covariance matrix as the data matrix in the path analyses. Pearson's correlation, Cronbach's alpha, Crosstab, Student's *t*-test, one way Anova and exploratory factor analyses were done with SPSS. Normality and multinormality testing, normal scores and covariance matrixes were calculated with Preliis 2.80. Path analyses were estimated with Lisrel 8.80.

### **Fit indices**

Likelihood ratio chi-square test ( $X^2$ ;  $p>0.05$ ), Root Mean Square Error of Approximation (RMSEA $\leq 0.05$ ) [84], Standardized Root Mean Square Residual (SRMR $\leq 0.05$ ) [85], Comparative Fit Index (CFI $\geq 0.95$ ) [86], and Normed Fit Index (NFI $\geq 0.95$ ) [87] were used as indices to goodness

of fit of the model. Minimum Akaike Information Criterion (MAIC) [88] was used to compare competing models; the model with the lowest value of the AIC among the competing models is deemed to fit the data best from a predictive point of view [83].

## Results

### Exploratory factor analysis

In both groups, the structure matrix suggested a factor structure similar to that of the pattern matrix, although with lower pattern matrix coefficients the structure matrix coefficients showed a fairly strong correlation with the other schema factor(s) (table 3). The schema factor structure was not identical in the two groups.

**Insert table 3 about here**

The factor structure in the pain patient group consisted of two schema factors (SF) and the total variance explained was 58.9%. The correlation between these 2 SFs was 0.80 (table 4a). The SF1 comprised all EMSs belonging to the Disconnection & Rejection schema domain (ED, AB, MA, SI, DS) and all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH). From the Other-Directedness schema domain there was SB EMS, from the Overvigilance & Inhibition schema domain EI EMS and from the Impaired Limits schema domain IS EMS. The SF2 consisted of all the remaining EMSs, namely SS, AS (Other-directedness schema domain), US, PU, NP (Overvigilance & Inhibition schema domain) and ET (Impaired Limits schema domain).

**Insert tables 4a and 4b about here**

In the control group, the results comprised 3 SFs and the total variance explained was 59.4%. The correlation between these 3 SFs was; SF1-SF2 0.68; SF1-SF3 0.72 and SF2-SF3 0.58 (table 4b). The SF1 consisted of all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH), SB (Other-Directedness) and NP (Overvigilance & Inhibition schema domain). The SF2 consisted of US, PU (Overvigilance & Inhibition), AS, SS (Other-Directedness) and ET EMSs (Impaired Limits). The SF3 comprised SI, ED, MA (Disconnection & Rejection) and EI EMSs (Overvigilance & Inhibition schema domain). AB, DS and IS EMSs did not load on any SF or loaded on two different SFs, thus they were excluded from the analyses.

### Model testing and modification

Correlations between the variables observed in the pain patient and control samples are shown in tables 4a and 4b respectively. To achieve the most parsimonious model with the best fit, the t-values of the paths were estimated. As a model modification procedure, the insignificant paths (one by one) were deleted.

In the pain patient group, the path from SF2 to BDI-II was removed first. The model was reanalyzed. According to the output statistics, a path was made from SF2 to pain disability and the model was reanalyzed. The data obtained supported model #2. The final model showed excellent fit indices (figure 1). An equivalent model was checked according to Kline [79]. SF2 and VAS were predicting PDS, and SF1, VAS and PDS were predicting BDI-II, which was the 'end state'. The model was not approved ( $\chi^2=18.7(2)$ ,  $p<0.001$ , RMSEA=0.178).

**Insert figure 1 about here**

In the control group, the path from SF2 to BDI-II was first deleted and the path analysis was reanalyzed. The path from SF3 to BDI-II was also deleted. The data obtained supported model #1. The final model showed excellent fit indices (figure 2). An equivalent model where VAS was



predicting PDS, and SF1, VAS and PDS were predicting BDI-II ('end state'), was not approved ( $\chi^2=4.15(1)$ ,  $p=0.0417$ , RMSEA=0.108).

Insert figure 2 about here

### Parameter estimates

#### Pain patient group

As the variables observed had different scales, the standardized regression coefficients are shown (figure 1). The effect size (squared multiple correlation= $R^2$ ) of BDI-II was approximately 11 times the effect size of VAS on pain disability. The SF1 accounted for 52% of the variance of BDI-II. Ninety three percent of the variance of VAS were unexplained. Two thirds (64%) of pain disability remained unexplained.

#### Control group

The standardized regression coefficients are shown in figure 2. The effect size of SF1 was approximately 4.5 times the effect size of VAS on BDI-II. The effect size of VAS was 5.6 times the effect size of BDI-II on pain disability. The SF1 and VAS accounted for 29% of the variance of BDI-II. Pain intensity and BDI-II accounted for 37% of the variance of pain disability.

#### Pain patient subgroups with different duration of pain

The best fit model (figure 1) of the pain patient sample was then reanalyzed with the three subgroups of pain duration (figure 3). The effect size of SF1 on depressiveness was 45 %, 48% and 58% in subgroups 1, 2 and 3, respectively. There was no path from SF2 to pain disability in subgroups 2 and 3. In the subgroup 1, the effect size of depressiveness on pain intensity was 9.6%. In subgroups 2 and 3, there was no more a significant path between pain intensity and depressiveness. In subgroups 2 and 3, pain intensity did not predict pain disability. The effect size of depressiveness on pain disability was 49 %, 31% and 24% in subgroups 1, 2 and 3, respectively. As the pain duration increased the error variance of pain disability increased. The fit indices were excellent in all subgroups.

Insert figure 3 about here

## Discussion

The present study tested two different biopsychosocial models of pain among pain patients and mildly painful controls. In both samples, early maladaptive schema factors were the main predictors of depressiveness. Significantly, the direction of effect between pain intensity and depressiveness was opposite in these groups; in the clinical pain patient sample depressiveness predicted pain intensity and in the control group vice versa. There was also a major difference between the groups in the effect sizes of pain intensity and depressiveness on pain disability. The main predictive factor for pain disability was depressiveness in the pain patient group and pain intensity in the control group. When the duration of pain increased over two years, depressiveness became the sole predictor of pain disability in the pain patient sample.

The measures indicated severe pain intensity, remarkable pain disability and mild depressiveness in the pain patient group. In the control group, the measures represented mild pain intensity and disability and minimal depressiveness. Keogh et al. [89] in their study among chronic pain patients found, when depression was severe that women reported greater disability than men. In the control group, women significantly outnumbered men. However, as there was only a little depressiveness in the control group, and no gender differences in depressiveness, we suppose this is not a cause for concern. The control group had a longer duration of education than the pain patient sample. First, this can be attributed to our sampling method, because the control group represented a working community while the pain patient sample included also those e.g. in early retirement. Second, the duration of education may be inversely associated e.g. with early traumatic adversities. The groups comprised people similar in age and the cultural background.

The schema factor (SF) structure was not identical in the two groups. In pain patients, the stronger SF1 comprised all EMSs belonging to the Disconnection & Rejection schema domain (ED, AB, MA, SI, DS) and all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH). From the Other-directedness schema domain there was SB EMS, from the Overvigilance & Inhibition schema domain EI EMS and from the Impaired Limits schema domain IS EMS [37]. The strongest loadings of SF1 reflected a pattern of inadequacy, shame, submission, failure, social isolation and dependence. This pattern included the both psychological and social dimensions of life and strongly predicted depressiveness in the pain patient group (effect size 52%) and resembled the study by Hoffart et al. [39] with mainly a clinical psychiatric sample where Impaired Autonomy and Disconnection schema domains predicted depressiveness 53%. When attention was paid to the individual EMSs, they were identical with those in our pain patient' sample. However, their study was based on a different and earlier YSQ, which did not include all the EMSs presented in this study. These studies support the significant value of Disconnection & Rejection and Impaired Autonomy & Performance schema domains as predisposing factors for depressiveness. Our data suggests the salient role of early emotional adversities in the development of depression in pain patients. Vulnerability to Harm or Illness (VH) EMS beliefs may well associate with pain catastrophizing, which in turn has shown to be a precursor of the pain-related fear [90]. The fear-avoidance model postulates that the behavioural consequences of pain-related fear – avoidance and hypervigilance –lead to disability and depression. The SF2 consisted of all remaining EMSs, namely SS, AS (Other-directedness schema domain), US, PU, NP (Overvigilance

& Inhibition schema domain) and ET (Impaired Limits schema domain) and reflected an '*encumbered*' pattern which was inversely and weakly associated with pain disability, and mainly in the earlier stages of chronic pain. We assume that the unrelenting standards, hypercriticalness, approval seeking and punitiveness first work against the experience of pain disability but subsequently prove to be maladaptive, so that according to Van Houdenhove et al. [91] the pain patient surpasses his/her limits and when this continues for years his/her body becomes painful. We speculate that then he/she succumbs to the core beliefs of SF1 (inadequate, shameful, submissive, failed, dependent and socially isolated) and becomes depressive.

In the control group, the results comprised three strongly correlating SFs. SF1 consisted of all EMSs belonging to the Impaired Autonomy & Performance schema domain (FA, EM, DI, VH), and SB (Other Directedness) and NP EMSs (Overvigilance and Inhibition schema domain). The strongest loading items reflected the content of an '*endangered*' person. SF2 consisted of US, PU (Overvigilance & Inhibition schema domain), AS, SS (Other Directedness) and ET EMSs (Impaired Limits) and reflected an '*encumbered*' role. SF3 comprised SI, ED, MA (Disconnection and Rejection schema domain) and EI EMSs (Overvigilance & Inhibition schema domain) and reflected a pattern of a '*lonely*' person. The SF1 predicted depressiveness with an effect size of 24%. According to the data, the patterns of failure, dependency, vulnerability and pessimism were the strongest predictors of depressiveness in the control group. Depressiveness was mainly predicted by early maladaptive schema factors, but the effect size was two times larger in the pain patient group. We assume that this reflects a stronger possibility of the existence of early, psycho-social adversities and their effect on depressiveness in pain patients.

In the pain patient group depressiveness predicted pain intensity. The effect size of depressiveness on pain intensity was rather small, namely about 7%. In the control group, the situation was the opposite; pain intensity predicted depressiveness and the effect size was 5%. The estimates support antecedent theory (depression precedes pain) in the pain patient group [46] but also the consequence theory (pain precedes depression) in the control group [45]. Thus it would be tempting to suggest that in the mild state of pain (the control group), pain intensity increases depressiveness and in the clinical state of pain (the pain patient group) the chain of events is inverse and depressiveness exacerbates pain intensity. However, we suppose that the two groups differ in their early experiences. A possible explanation mechanism, referring to the diathesis-stress model [92,93], is that chronic pain patients have psycho-social diathesis [SF1] and the stress of chronic pain triggers the depression which in turn compounds disability [62] and deficiency in the descending inhibitory system of pain [94].

The modified model by Arnstein [52] was vindicated in the control sample. Pain intensity predicted depressiveness for a little degree and was the main predictor of pain disability, which was the 'end state' of the variables used. The ratio of the effect sizes of pain intensity and depressiveness on pain disability was almost six to one. This would suggest that to treat pain is the way to alleviate pain disability in a group of people with mild pain. This would also reduce their risk of depressiveness. In the pain patient group, the effect size ratio of depressiveness and pain intensity on pain disability was eleven to one. Therefore, depressiveness was largely the predictor of pain disability and also predicted some pain intensity. We carefully assume, in light of our results, that to treat pain

disability among chronic pain patients is mainly to treat their depression, which may also decrease their pain intensity.

Two thirds of the variance of pain disability could not be explained in this study. The Pain Disability Scale (PDS) is a fairly easy measure for pain patients to fill in as they can attribute all their limitations in their lives to pain. It may be much more difficult for the first time visitor to describe his/her depression (BDI-II) or intimate feelings and thoughts (YSQ-S2-extended). Patients are often afraid that their pain is believed to be all in their heads, probably because of earlier experiences, and because of the body-mind dualistic view of biomedical medicine [1,95,96]. The measuring of such things is always prone to an error. A thorough interview and a secure doctor-patient relationship may serve to elicit these aspects.

Among the subgroups of pain duration [the chronic pain patients], the path from pain intensity to pain disability became non-significant when the duration of pain increased over two years. This indicated the salient role of depressiveness on pain disability. Also, depressiveness and pain intensity no more had an effect on each other in the longer states of pain [over two years of pain duration]. The effect size of SF1 on depressiveness increased from 45% to 58% and indicated a close relation between the patterns of inadequacy, shame, submission, failure, social isolation, dependence and depressiveness in the temporally longer states of pain. The SF2, which reflected an '*encumbered*' role, had a negative effect on pain disability, but only at the shortest duration of pain [subgroup 1]. We ask if SF2 acts against pain disability but at the same time it will wear up the painful body. That would be in accordance with a recent study where chronic pain patients showed high rates of self-sacrificing and demanding characteristics which also decreased their ability to set limits and efforts to rehabilitate themselves [97]. One would argue that BDI-II and pain disability scale scores measure the same variables i.e. depressiveness. However, in the control group the situation was opposite - pain intensity was highly related to pain disability. Lastly, the error variance of pain disability increased when the duration of pain became longer. One reason for this might be the fact that the subgroup 3 was significantly older and increasing age among other unknown factors may have an independent effect on disability [6].

The strengths of the study are due to the material used. Both samples were large and the required case/parameter ratio was sufficient for the path analysis estimation method used. The models tested gave a satisfactory view of the different causes and effects between the variables observed. The pain patients represented six different pain clinics reflecting an extensive sample. The pain diagnoses varied and did not represent narrow categories. The two different populations in two different pain states gave a good opportunity to study the connection between pain intensity, depressiveness and pain disability. To the best of our knowledge, this was also the first paper to study the effects of early maladaptive schema factors on depressiveness and pain disability in a pain population with a path-analysis method. The subgroups of pain duration widened the view of the close relationship between depressiveness and pain disability.

This study has several limitations. It lies on the self-report method of analysis. The measuring of subjective beliefs, thoughts and attitudes with a questionnaire is controversial. We used the word 'depression' in this study although it was measured with BDI-II. Unfortunately, it was not possible

to conduct an ordinary psychiatric interview because the sample was gathered from several pain clinics by many different physicians not specialised in psychiatry. We believe, however, that measuring of pain intensity as a subjective sensation is possible. The study design was cross-sectional. Only prospective and follow-up analyses will give an exhaustive picture of the causes and effects. However, our study consisted of two groups similar in age and cultural background, but at the different levels and states of pain - employees working and pain patients suffering with pain. We therefore had two different perspectives on pain. A third limitation relates to the pain disability assessment used in this study (Please see subsection 'Pain disability assessment').

The results of this study supported several important findings. Schema factor 1 explained half of the variance of depressiveness in the pain patient sample. It included the both psychological and social aspects of life of the pain patient. The association between depressiveness and the patterns of inadequacy, shame, submission, failure, social isolation and dependence became larger when the duration of pain increased. The relation between pain intensity and depressiveness was inverted between the two groups. In the control group, pain intensity predicted depressiveness and in the pain patient group depressiveness predicted pain intensity. Both pain intensity and depressiveness predicted pain disability. According to the effect sizes, depressiveness predicted almost exclusively pain disability in the pain patient group, whereas pain intensity was the main predictor of pain disability in the control group. Based on the cross-sectional design we must, however, be careful when making causative interpretations. In the light of our data, we carefully suggest that pain intensity might be the main focus of treatment in the mild states of pain. Among clinical pain patients, the role of depressiveness is important and may even be the main focus of treating disability, especially when the duration of pain increases. Among severely depressed chronic pain patients, schema therapy can be a choice more for better outcomes in pain intensity and disability.

### Declaration of interest

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**Table I:** Schema Domains and Early Maladaptive Schemas with example items [37].

Schema Domain	Early Maladaptive Schema	Example item
Disconnection & Rejection	1. Abandonment/ Instability	<i>"I worry that people I feel close to will leave me or abandon me."</i>
	2. Mistrust / Abuse	<i>"I'm usually on the lookout for people's ulterior motives."</i>
	3. Emotional Deprivation	<i>"I have rarely had a strong person to give me sound advice or direction when I'm not sure what to do"</i>
Impaired Autonomy & Performance	4. Defectiveness/ Shame	<i>"I feel that I'm not lovable."</i>
	5. Social Isolation/ Alienation	<i>"I feel alienated from other people."</i>
	6. Dependence/ Incompetence	<i>"I do not feel capable of getting by on my own in everyday life."</i>
Impaired Limits	7. Vulnerability to Harm or Illness	<i>"I feel that a disaster (natural, criminal, financial, or medical) could strike at any moment."</i>
	8. Enmeshment/ Undeveloped Self	<i>"It is very difficult for my parent(s) and me to keep intimate details from each other, without feeling betrayed or guilty."</i>
	9. Failure	<i>"I'm not as intelligent as most people when it comes to work (or school)."</i>
Other-Directedness	10. Entitlement/ Grandiosity	<i>"I hate to be constrained or kept from doing what I want."</i>
	11. Insufficient Self-Control/ Self-Discipline	<i>"I can't force myself to do things I don't enjoy, even when I know it's for my own good."</i>
	12. Subjugation	<i>"I have a lot of trouble demanding that my rights be respected and that my feelings be taken into account."</i>
Overvigilance & Inhibition	13. Self-Sacrifice	<i>"I'm the one who usually ends up taking care of the people I'm close to."</i>
	14. Approval-Seeking/ Recognition-Seeking	<i>"Lots of praise and compliments make me feel like a worthwhile person"</i>
	15. Negativity/ Pessimism	<i>"You can't be too careful; something will almost always go wrong "</i>
	16. Emotional Inhibition	<i>"I find it embarrassing to express my feelings to others."</i>
	17. Unrelenting Standards/ Hypercriticalness	<i>"I must meet all my responsibilities."</i>
	18. Punitiveness	<i>"I often think about mistakes I've made and feel angry with myself"</i>

**Table II.** The baseline characteristics, pain and depressiveness variables of the pain patient and control groups.

	Pain patient group			Control group			
	N=268			N=271			
variable	Mean	SD	Range	Mean	SD	Range	p value
Age	47.1	9.3	18-64	47.5	9.2	19-62	0.60 ‡
Gender (Male/ Female)			125/143			30/235/6 <sup>#</sup>	<0.001 *
Duration of education	11.1	1.6	10-18	13.0	2.9	9-18	<0.001 ‡
Pain Intensity	5.9	1.2	2.5-9.5	3.3	1.7	0.3-8.3	<0.001 ‡
Pain disability scale	16.5	5.0	3-27	5.9	4.5	0-22	<0.001 ‡
BDI-II	15.6	10.1	0-50	7.2	6.7	0-35	<0.001 ‡

Note:       <sup>#</sup> =gender not mentioned in six cases  
               \* =Chi-square  
               ‡ =Student's *t*-test



**Table III.** Principal axis factoring (promax rotation) of the early maladaptive schemas in the pain patient and control groups with 2 and 3 higher order schema factors respectively.

		Pain patient group							Control group					
		Schema Factors							Schema Factors					
Early maladaptive schema	<i>ab.</i>	1		2				1		2		3		
		p	s	p	s	<i>h</i> <sup>2</sup>		p	s	p	s	p	s	<i>h</i> <sup>2</sup>
Emotional Deprivation	ED	.797	.746	-.072	.498	.559		.098	.540	-.148	.293	.770	.764	.598
Abandonment/Instability	AB	.441	.671	.322	.637	.501		<del>.380</del>	<del>.620</del>	<del>.147</del>	<del>.478</del>	<del>.228</del>	<del>.561</del>	<del>.433</del>
Mistrust/Abuse	MA	.605	.729	.174	.606	.546		.191	.633	.215	.557	.466	.704	.568
Social Isolation/Alienation	SI	.867	.849	-.025	.594	.722		-.030	.584	.073	.473	.837	.853	.731
Defectiveness/Shame	DS	.938	.865	-.102	.568	.753		<del>.539</del>	<del>.739</del>	<del>-.146</del>	<del>.369</del>	<del>.416</del>	<del>.711</del>	<del>.640</del>
Failure	FA	.895	.773	-.170	.469	.612		.829	.744	-.130	.337	-.016	.486	.566
Dependence/Incompetence	DI	.802	.760	-.059	.514	.580		.738	.748	-.070	.388	.073	.542	.564
Vulnerability to Harm or Illness	VH	.456	.668	.297	.623	.489		.633	.673	.147	.476	-.065	.441	.467
Enmeshment/Undeveloped Self	EM	.527	.571	.062	.438	.328		.534	.613	-.067	.324	.171	.503	.392
Subjugation	SB	.897	.825	-.101	.540	.685		.540	.727	-.115	.379	.370	.682	.602
Self-Sacrifice	SS	-.136	.266	.564	.466	.227		-.125	.172	.518	.447	.000	.173	.210
Emotional Inhibition	EI	.618	.691	.102	.544	.483		.105	.525	.175	.468	.467	.627	.430
Unrelenting Standards/Hypercriticalness	US	-.197	.345	.759	.618	.401		-.301	.314	.780	.730	.246	.430	.581
Entitlement/Grandiosity	ET	.287	.624	.473	.677	.499		-.010	.451	.479	.610	.274	.506	.426
Insufficient Self-Control/Self-Discipline	IS	.447	.661	.300	.619	.481		<del>.269</del>	<del>.555</del>	<del>.300</del>	<del>.537</del>	<del>.167</del>	<del>.501</del>	<del>.394</del>
Approval-Seeking/Recognition-Seeking	AS	-.025	.474	.698	.681	.463		.189	.453	.770	.749	-.259	.254	.597
Negativity/Pessimism	NP	.391	.735	.482	.761	.655		.578	.715	.349	.634	-.091	.478	.590
Punitiveness	PU	.212	.683	.659	.810	.678		.174	.509	.655	.726	-.058	.388	.542
Eigenvalue		9.13		1.48				7.80		1.81		1.09		
		Kaiser-Meyer-Olkin 0.943						Kaiser-Meyer-Olkin 0.913						
		Bartlett's test of sphericity <0.001						Bartlett's test of sphericity <0.001						
		Total variance explained 58.9%						Total variance explained 59.4%						
		Rotation converged in 3 iterations.						Rotation converged in 7 iterations.						

Note: *ab.*=abbreviation, p=pattern coefficient, s=structure coefficient,  $h^2$ =communalities. The EMSs with pattern and structure coefficients with ~~strike through text~~ were not included in the final exploratory analysis.

**Table IVa:** Bivariate Pearson's correlation matrix of variables observed in the pain patient sample (n=268).

	PDS	BDI-II	VAS	SF1
BDI-II	0.56**			
VAS	0.31**	0.26*		
SF1	0.36**	0.72**	0.24*	
SF2	0.25*	0.59**	0.21*	0.80**

**Table IVb:** Bivariate Pearson's correlation matrix of variables observed in the control sample (n=271).

	PDS	BDI-II	VAS	SF1	SF2
BDI-II	0.34**				
VAS	0.57**	0.23*			
SF1	0.10	0.49**	0.00		
SF2	0.08	0.34**	0.01	0.68**	
SF3	0.12	0.41**	-0.01	0.72**	0.58**

Note:

\* 0.05 > p ≥ 0.01

\*\* p < 0.01

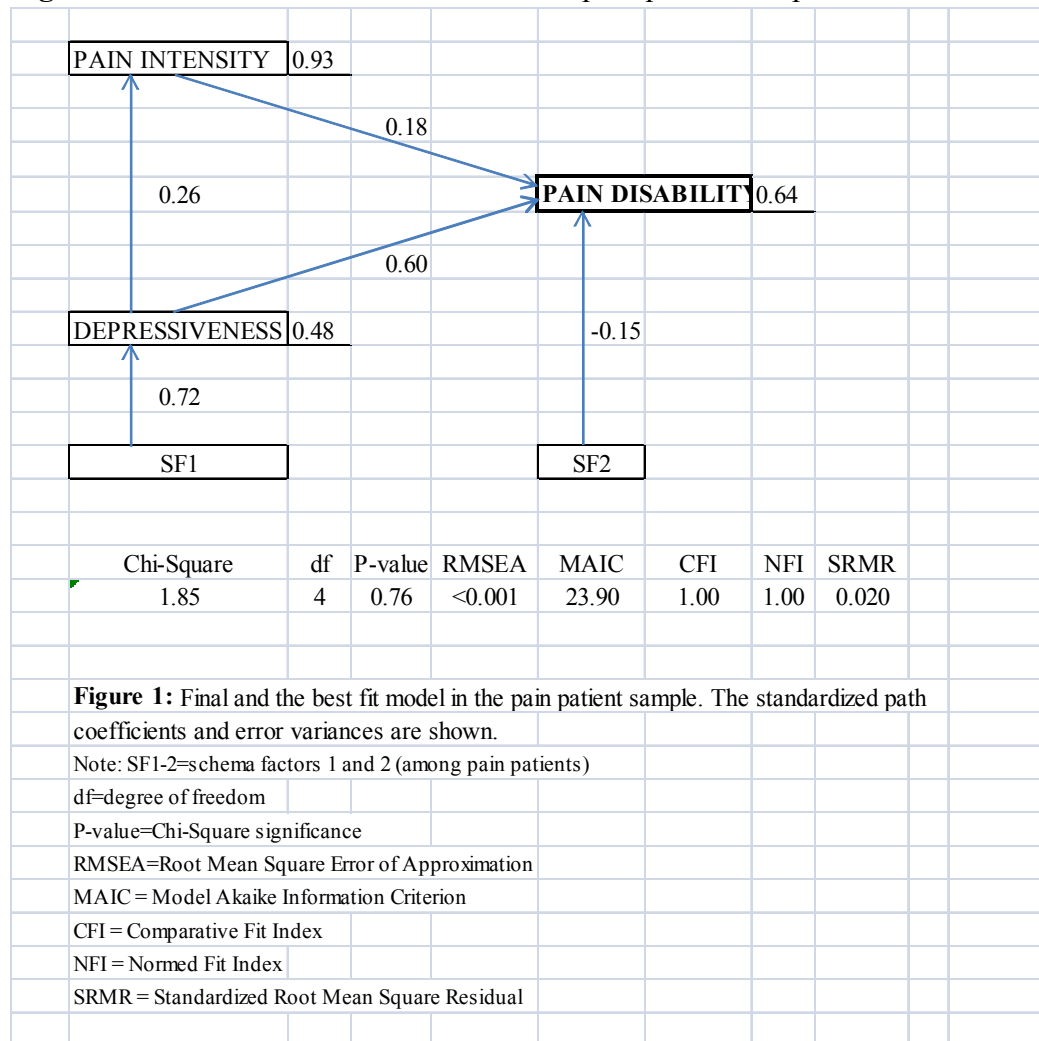
PDS=Pain disability scale

BDI-II= Beck Depression Inventory-2<sup>nd</sup> edition

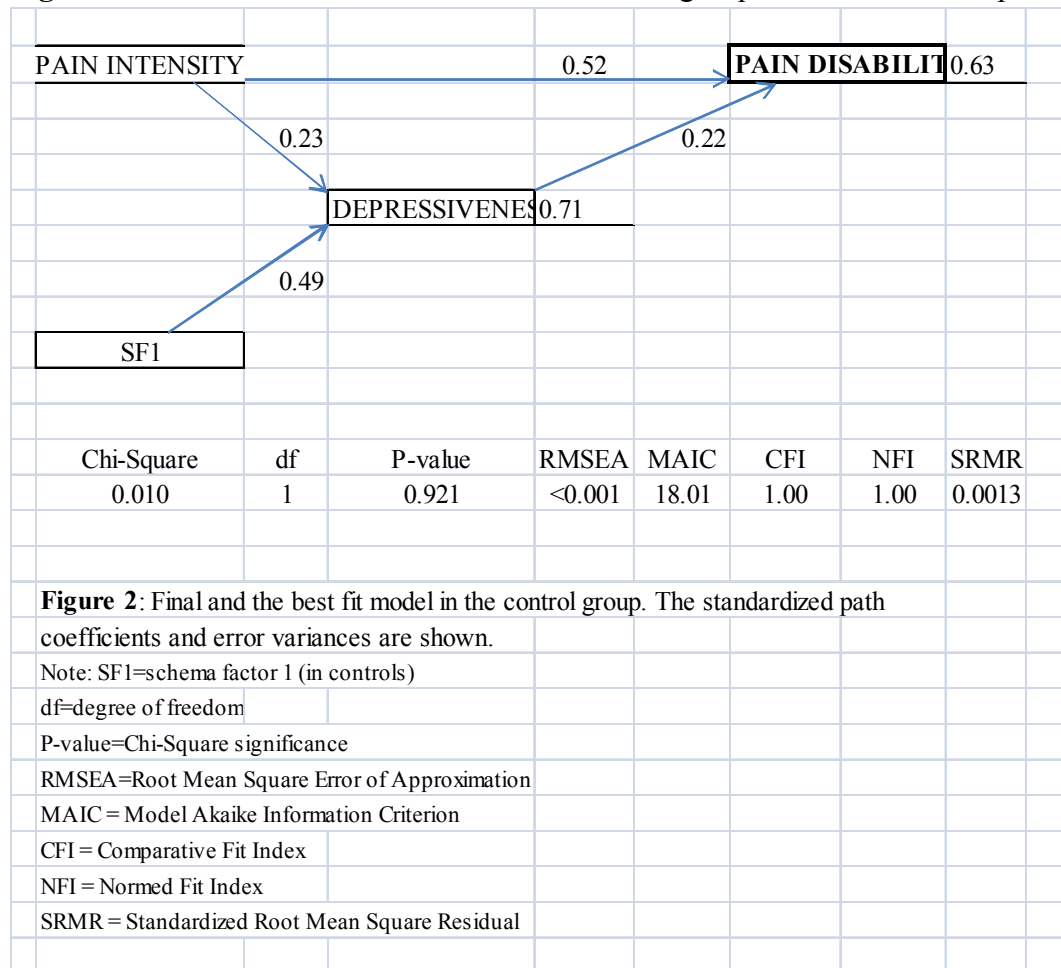
VAS=Visual analogue scale of pain intensity

SF1-3= (Schema factors 1-3)

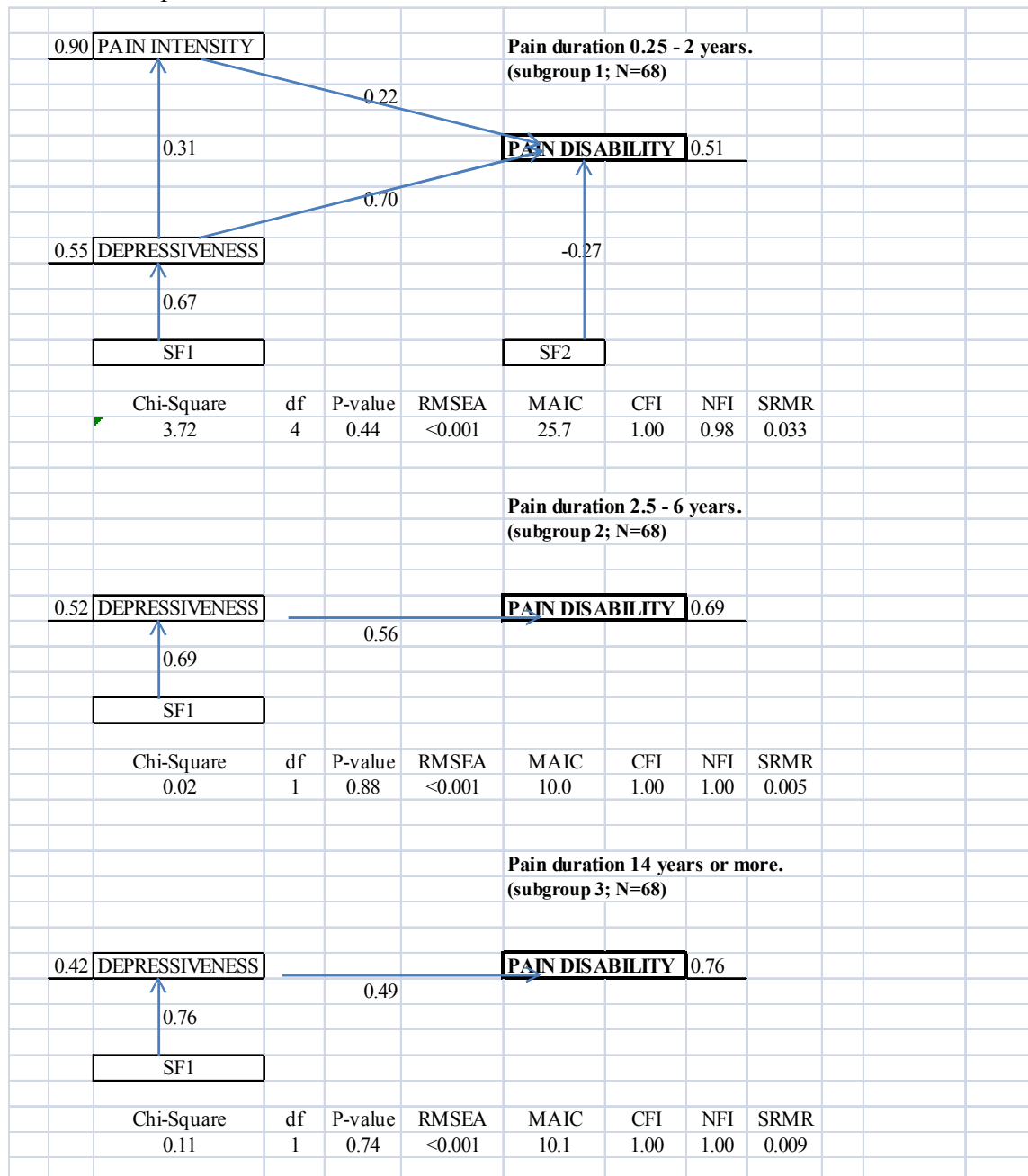
**Figure 1:** Final and the best fit model in the pain patient sample. The standardized path coefficients and error variances are shown.



**Figure 2:** Final and the best fit model in the control group. The standardized path coefficients and error variances are shown.



**Figure 3:** The pain models of three subgroups of pain duration in the pain patient sample. The standardized path coefficients and error variances are shown.



**Figure 3:** The pain models of three subgroups of pain duration in the pain patient sample. The standardized path coefficients and error variances are shown.

Note: SF1-2=schema factors 1 and 2 (in pain patients).

df=degree of freedom

P-value=Chi-Square significance

RMSEA=Root Mean Square Error of Approximation

MAIC = Model Akaike Information Criterion

CFI = Comparative Fit Index

NFI = Normed Fit Index

SRMR = Standardized Root Mean Square Residual