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"Type D personality and ill-health among Swedish adolescents"

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The link between mind and body is powerful and immediate
Costa & McCrae 1987

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This Licentiate is based on the following papers:

Paper I

Type D personality is a risk factor for psychosomatic symptoms and musculoskeletal pain among adolescents: a cross-sectional study of a large population-based cohort of Swedish adolescents.

Condén E, Leppert J, Ekselius L, Åslund C.

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Paper II

Type D personality is associated with sleep problems in adolescents. Results from a population-based cohort study of Swedish adolescents

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Table 1. Included studies

	Paper I	Paper II
Overall aim	Type D personality is associated with an increased number of health complaints among adolescents. The overall aim of this licentiate thesis was to examine the impact of Type D personality on adolescents' self-perceived health.	
Aim	To investigate the prevalence of Type D personality in adolescents and associations between Type D personality, self-reported psychosomatic symptoms and musculoskeletal pain	To investigate whether Type D personality was associated with sleep problems among adolescents
Methods	Population-based self-reported cross-sectional study of 5129 school students between 15-18 years old.	
Results	12.5% were classified as Type D personality (10.4% boys, 14.6 % girls). There was a strong association between Type D personality, psychosomatic symptoms and musculoskeletal pain, were adolescents with Type D personality reported more symptoms. Boys and girls with a Type D personality had an approximately 2-fold increased risk of musculoskeletal pain and a 5-fold increased risk of psychosomatic symptoms.	Adolescents with a type D personality had an approximately four times increased risk of having sleep problems. Moreover, Type D personality was associated with sleeping fewer hours, especially during school nights.
Conclusion	More than every tenth adolescent was classified as a Type D personality. Type D personality may be an important factor in increasing the risk of suffering from musculoskeletal, and above all, psychosomatic symptoms among adolescents.	Type D personality individuals are particular vulnerable to effects of stress. The presence of Type D personality associated with poor sleep demands attention because sleep problems may be an early stage in the development of later diseases

Abbreviations

NA= Negative affectivity

SI= Social Inhibition

SES= Family socioeconomic status

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Introduction

Type D personality, or the distressed personality, was originally recognized following observations of patients with ischemic heart disease. When I was working as a registered nurse in the Cardiac Intensive Care Unit I observed patients with strong characteristics of this personality type. I was involved in these patients' struggles and touched by their suffering. I started to wonder what had happened in their lives prior to their arrival at the hospital with a heart disease. Was their health already compromised as adolescents?

Personality

The roots of the clinical approach to personality can be traced to Sigmund Freud, although Hippocrates and Galen had long ago written about personality in terms of associations between bodily humors (blood, black bile, yellow bile, phlegm) and temperament (sanguine, melancholic, choleric, phlegmatic) [1]. The term personality refers to psychological qualities that contribute to an individual's characteristic patterns of feeling, thinking and behavior [2]. A personality is stable over time and is a result of heredity and the environment [2, 3]. Personality characteristics are established early in life, and they develop into a mature personality around the age of 20 [3]. Basic personality characteristics are primarily biological in origin, including gene function, brain biochemical activity and physiological reactivity. Through a dynamic and complex interplay between genes and environment, each person's unique combination of basic traits composes his/her personality [4]. A trait is a disposition to behave in a particular way, as expressed in one's behavior over a range of situations [1]. Cultural context, the social environment and life experiences from infancy through late adolescence can strengthen or weaken traits. The history of personality research is vast with several approaches to personality traits [1]. During the 1920s, Allport adopted the trait as the fundamental conceptual unit of personality [5, 6]. Cattell further refined the concept through methodological developments in personality research [7]. Eysenck argued that personality consists of three factors –extraversion, neuroticism, and psychoticism [8]. However, the “Big Five” factor theory presented by McCrae and Costa [9], dominates research in the field today [3]. The “Big Five”, the factors of personality are Neuroticism, Extraversion, Conscientiousness, Agreeableness and Openness to Experience [9]. Personality is reflected in lifestyle, how we look at ourselves and in relation to our surroundings [10]. There are four

dimensions of personality: 1. Cognitions, how we perceive and interpret ourselves, other people and events, 2. Affectivity, which refers to the repertoire, intensity and movement of emotions and their expression in different situations, 3. Relation to other humans, and, 4. Impulse control [10].

Type D personality

Type A and B personalities were identified in the 1950s. Type A behavior, as defined by Friedman and Rosenman, is hard-driving, competitive, aggressive and hurried [11]. It has been generally accepted that the Type A behavior is a risk factor for the development of coronary artery disease. However, there have been conflicting results, in the literature primarily because of differences in methods and measurements of Type A behavior [12]. As a result, researchers have begun to focus on subcomponents of the Type A behavior pattern, particularly hostility and anger, that appear to be more reliable predictors of coronary artery disease [12, 13]. Those who are typically more relaxed, easygoing and satisfied are labeled Type B personality [14]. Similarly, there appears to be a Type C personality that characterizes cancer patients [15]. They tend to be overly cooperative, appeasing, over-patient and defensive and they avoid conflict and seek harmony [15, 16].

Type D personality, or the distressed personality, was proposed by the psychologist Denollet in 1996 and it was originally identified following observations of patients with ischemic heart disease [17]. This personality type has been associated with a variety of emotional and social difficulties, and increased morbidity and mortality in patients with established cardiovascular disease [18-21]. Several studies have found associations between Type D personality and an increased number of health and somatic complaints, low self-rated health, sleeping problems, heightened perception of negative emotions, and a negative impact on mental and physical health and a less healthy life style [22-25]. Type D personality also plays a clinically relevant role in psychological health outcomes as Type D patients report significantly higher levels of anxiety, depressive mood, perceived psychophysical stress, interpersonal difficulties and social anxiety, diminished psychophysical wellbeing and quality of life [26]. Type D personality seems to be associated with more passive and maladaptive types of coping strategies [26-28]. Type D personality is characterized by two personality traits; negative affectivity and social inhibition [29]. Negative affectivity (NA), is the tendency to experience negative emotions, feelings of dysphoria, anxiety, irritability and apprehension [30], and vulnerability to anxiety and depression [31]. Social inhibition (SI), is the tendency to inhibit

the expression of emotions [29], paired with interpersonal stress and the failure to adapt [32]. The synergistic effect of NA and SI is a higher risk of several emotional and social difficulties such as depression, anxiety, a low level of subjective well-being, lack of social support and low quality of life [22]. Neuroticism, a factor in the big five personality theory, has been described resembling the Type D personality, especially with respect to the NA subscale [33]. Type D personality is thought to have a normal aetiology, and therefore it should not to be classified as a DSM-IV personality disorder.

Biological and behavioral mechanisms that mediate Type D personality can lead to poor health outcomes. Several researchers have tried to explain the relationship between Type D personality and adverse health effects, but the results have been inconsistent. Howard and Hughes [34], reported a weak myocardial response to an active stressor in Type D individuals, implicating cardiovascular reactivity to psychological stress as a possible mechanism involved in Type D cardiovascular health problems. However, Nyklíček et al examined the relationship between Type D personality and cardiovascular functioning in the everyday lives of people without documented cardiovascular disease and found that Type D personality generally does not seem to be associated with unfavorable cardiovascular functioning [35]. Research on the relationship between Type D personality and laboratory indices of cardiovascular health indicates that socially inhibited men have heightened blood pressure reactivity and that NA is related to a dampened heart rate change during stress [36]. Both Type D dimensions (NA and SI) were associated with greater cortisol reactivity to stress in this study [36]. Williams et al compared Type D and non-Type D males and found that the former group exhibited significantly higher cardiac output during a stress condition [37]. However, there was no relationship between Type D and cardiovascular reactivity in females. In addition, Type D individuals exhibited significantly higher feelings of subjective stress compared with non-Type D individuals in a laboratory test [37].

Type D personality and adolescent health

Type D personality is related to maladaptive health behaviors and lower levels of social support in adults [38, 39], as well as in healthy younger individuals [40]. Children with the type D pattern have more somatic complaints than non-type D children [41]. Zhang et al reported that Chinese adolescents with Type D personality were prone to depressive symptoms and an increased risk of depression [42]. Among adolescents with depression, those with Type D personality report higher levels of distressed emotions and more unhappy

life events. Their social activities seem prone to self-inhibition over worries about being rejected, and the results emphasize NA [42]. Lee et al reported that 18.2% of healthy Korean adolescents had a Type D personality [43]. These adolescents experienced various and more severe mental health problems such as a greater risk of negative psychological well-being than did their peers with non-type D personalities. Lee et al further found that Type D personality was related to both internalizing (psychiatric problems, learning and attention, family relationship and self-control), and externalizing (conduct behavior, sexual behavior and sexual desire) problems, but with a higher level of internalizing symptoms [43].

General and specific aims

The overall aim of this licentiate thesis was to examine the impact of Type D personality on adolescents' self-perceived health.

Paper I

Type D personality is a risk factor for psychosomatic symptoms and musculoskeletal pain among adolescents: a cross-sectional study of a large population-based cohort of Swedish adolescents

Aim: To investigate the prevalence of Type D personality in adolescents and associations between Type D personality and self-reported psychosomatic symptoms and musculoskeletal pain.

Paper II

Type D personality is associated with sleep problems in adolescents. Results from a population-based cohort study of Swedish adolescents

Aim: To investigate the associations between Type D personality and sleep problems in adolescents.

Method

Study design

Population-based, cross-sectional study based on self-reported data.

Participants and data collection

Both of the papers reported here are based on data from a questionnaire study performed on school students in Västmanland, Sweden during 2008. All of ninth grade (15-16 years old) and second year secondary school (17-18 years old) student were asked to complete a self-report questionnaire during school time. The questionnaire was part of the Survey of Adolescent Life in Vestmanland 2008 (SALVe 2008), which is distributed biannually by the County Council of Västmanland to monitor the psychosocial health of adolescents in the county. In addition to collecting demographic background, the survey included questions about psychosomatic- and musculoskeletal symptoms, sleep habits and Type D personality. Of the 5129 adolescents who completed the questionnaire, 58 late-responders returned their questionnaires by mail. The distribution of the study population is presented in Figure 1.

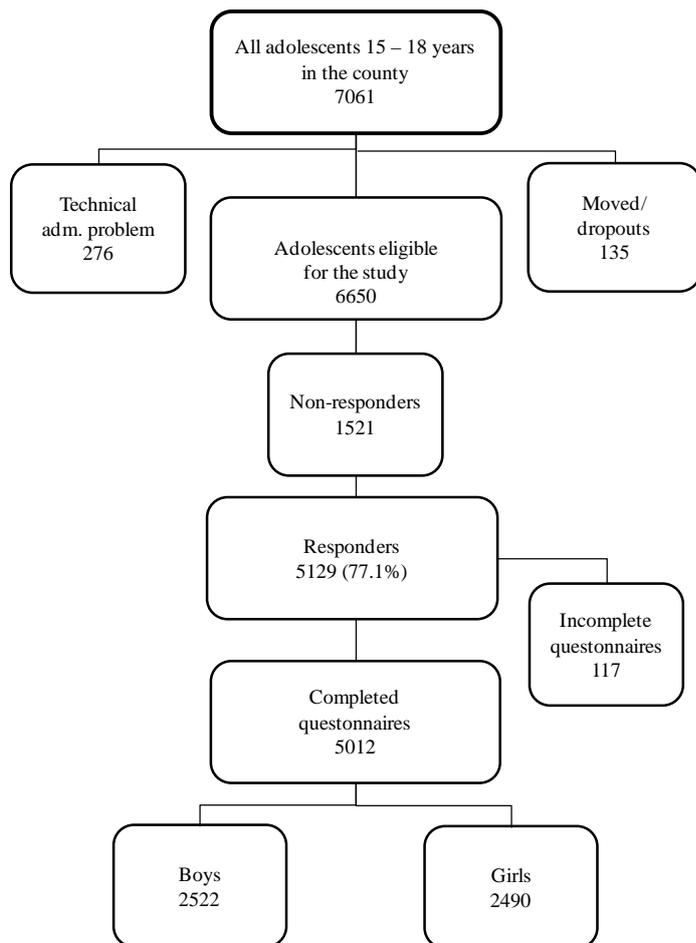


Figure 1. Flow chart of the study population

Ethical considerations

Participation in the study was anonymous and voluntary. The participants were given written and verbal information regarding the study and were assured that they could refuse to participate at any time without providing an explanation. The Helsinki Declaration's [44] ethical standards for scientific work, were followed throughout the project.

Measurements

Type D personality

To assess the Type D personality, the DS14 questionnaire was used [45], which is a 14-item questionnaire that measures NA and SI. Participants respond to each item on a five-point Likert scale 0 = false, 1 = rather false, 2 = neutral, 3 = rather true and 4 = true. The NA and SI scales can be scored as continuous variables (0-28) to assess these personality traits independently. A score of 10 or more on both scales is used to classify respondents as having

a Type D personality. Denollet based the cut-off on the median split in representative samples and clinical evidence for this cut-off based classification was obtained in longitudinal clinical studies and empirical evidence from latent class cluster analysis [46]. The DS14 has been validated in several European countries [47] and is regarded as valid and reliable, with a reported Cronbach's α of 0.88/0.86 and a 3-month test-retest reliability of $(r) = 0.72/0.82$ for the NA and SI subscales respectively in an adult population [29]. We used the Swedish version of the DS14 [48].

Psychosomatic symptoms

The participants were asked how often they suffered from: 1: headache, 2: stomach ache, 3: feelings of nervousness, 4: feelings of irritation and 5: sleep problems. The internal consistency (Cronbach's alpha) of the psychosomatic symptoms questions was 0.75. The index was then divided by standard deviations, and +1 SD was used as the cut-off for many psychosomatic symptoms and - 1 SD the cut-off for few psychosomatic symptoms. Then we merged the intermediate (medium symptoms) and few psychosomatic symptoms groups into a single group, namely those with few-medium psychosomatic symptoms.

Musculoskeletal pain

The participants were asked how often they suffered from 1: pain in the shoulders/neck, 2: pain in the back/hips, and 3: pain in the hands/knees/legs/feet. The participants rated these items on a five-point scale: never = 0, seldom = 1, sometimes = 2, often = 3, always = 4, and a 0-12 point summation index was created for each participant. The internal consistency (Cronbach's alpha) of the musculoskeletal pain symptoms questions was 0.69. The index was then divided by standard deviations, and +1 SD was used as the cut-off for many musculoskeletal pain symptoms and - 1 SD the cut-off for few musculoskeletal pain symptoms. Then we merged the intermediate (medium symptoms) and few musculoskeletal pain symptoms groups into a single group, namely those with few-medium musculoskeletal pain symptoms

Sleep disturbances

To measure sleep disturbances, we used a modified version of the Karolinska Sleep Questionnaire [49], which asks about the frequency of sleep disturbances and subjective sleep quality. The questionnaire queried the frequency of the following disturbances in the previous three months, how often have you experienced: difficulties waking up?; insufficient sleep?; not being thoroughly rested?; disturbed sleep?; feeling exhausted when waking?; sleepiness

during school work?; sleepiness during your spare time?; drowsiness/prolonged fatigue?. The participants responded to these items on a six-point scale: Never = 0, Seldom, occasional moments = 1, Sometimes, a few times per month = 2, Often, 1-2 times per week = 3, Mostly, 3-4 times per week = 4, Almost always, 5 times per week or more = 5. A 0-40 points summation-index was created. The internal consistency of the index items was $\alpha = 0.90$. A few-many sleep disturbance dichotomous variable was created using +1 SD as the cut-off for many sleep disturbances.

Sleep hours

We chose to distinguish between school nights and weekend nights in the analyses. The participants rated their sleep hours with the following questions: 1. How long do you sleep, on average, on school nights? 2. How long do you sleep, on average, on weekends? The answer alternatives were: less than 3 hours = 1, about 3-4 hours = 2, about 4-6 hours = 3, about 7-8 hours = 4, about 9-10 hours = 5, 11 hours or more = 6. We created a dichotomous sleep variable for the school nights and for the weekend nights using < 6 hours sleep per night as the cut-off in each case.

Demographic data

The demographic variables were: sex, parental employment status, ethnicity, housing conditions, and socioeconomic status.

Control variables

We measured several control variables to adjust for the effects of potentially confounding factors: body mass index, exercise habits, smoking habits, computer use and alcohol consumption.

Statistical analyses

The statistical analyses in paper I and II were performed in IBM SPSS Statistics IBM Corp., Armonk, New York, USA) version 17,18 and 20.

Table 2. Statistical analyses used in the papers for this thesis

	Differences between groups	Reliability	Associations	Regressions
Paper 1	Mann Whitney U	Cronbach's alpha	Spearman's rank correlation ^a	Binary logistic regression ^b
Paper 2	χ^2 Mann Whitney U	Cronbach's alpha	Spearman's rank correlation	General linear regression ^c Binary logistic regression ^d

^a Based on raw scores

^b Based on both raw score and Z-transformed scores

^c Based on a summation index of the two subscales NA and SI

^d Univariate, multivariate and interaction models

Summary of the results

In the present study, a total of 10.4 % of the boys, and 14.6 % of the girls were classified as Type D personality.

Paper I

Girls were three times as likely as boys to have many psychosomatic symptoms, and they were twice as likely to have many musculoskeletal pain symptoms. Type D personality was moderately correlated with psychosomatic symptoms (boys $r = 0.467$, girls $r = 0.513$), and somewhat weaker correlated with musculoskeletal pain (boys $r = 0.289$, girls $r = 0.294$). A logistic regression analysis revealed that both boys and girls with a Type D personality were approximately twice as likely to have musculoskeletal pain and five times as likely to have psychosomatic symptoms as non-Type D students. The logistic regression analyses explained more variance in the psychosomatic symptoms than in the musculoskeletal pain symptoms, and in general the analyses explained more variance in the girls' responses (Table 3). A logistic regression interaction model, of Z-score transformations of NA and SI scales indicated that a high score on the NA scale was associated with increased odds of having many musculoskeletal pain symptoms, whereas a high score on the SI scale was associated with a decreased risk of musculoskeletal symptoms for the girls. No interaction effects between NA and SI were found for the boys or the girls for musculoskeletal symptoms. A similar pattern was found regarding psychosomatic symptoms, where an $NA > 10$ was associated with a four-fold increased odds for boys and girls, but no effect was found for SI or the interaction between NA and SI in the adjusted models.

Table 3. Logistic regression models of the relationship between Type D personality and many musculoskeletal symptoms and between Type D personality and many psychosomatic symptoms for boys and girls. Odds ratio (OR), 95 % CI, p-values, are shown for both unadjusted models and for models adjusted for confounding factors.

	Boys						Girls					
	Unadjusted model			Adjusted model ^a			Unadjusted model			Adjusted model ^a		
	OR ^b	95 % CI	p	OR ^b	95 % CI	p	OR ^b	95 % CI	p	OR ^b	95 % CI	p
Model 1												
<i>Many musculoskeletal symptoms</i>												
Type D personality	2.42	1.70-3.44	<0.001	2.39	1.62-3.52	<0.001	2.46	1.93-3.13	<0.001	2.38	1.82-3.11	<0.001
	$R^2 =$			$R^2 =$			$R^2 =$			$R^2 =$		
	1.8%			3.4%			3.1%			4.4%		
<i>Many psychosomatic symptoms</i>												
Type D personality	5.74	4.23-7.80	<0.001	5.39	3.83-7.57	<0.001	5.43	4.29-6.88	<0.001	5.54	4.26-7.21	<0.001
	$R^2 =$			$R^2 =$			$R^2 =$			$R^2 =$		
	9.0%			11.7%			11.4%			14.4%		

^a Adjusted for living conditions, parental employment status, ethnicity, socioeconomic status, BMI, and exercise habits.

^b Nagelkerke R^2 is given for the analysis of each symptom category, separated by sex.

Paper II

Adolescents with Type D personality were four times more likely to have sleep problems, and they were also more likely to sleep less, especially on school nights. Among the correlations between outcome variables, only the association between NA and sleep disturbances was moderately strong ($r=0.48$). Type D personality was also associated with less sleep on the weekend nights, and the main effect of the Type D personality remained after adjusting for the control variables alcohol use, exercise habits, everyday smoking, excessive computer use and family SES. In the general linear model, there was an association between Type D personality and sleep disturbances, as well as an interaction between Type D personality and alcohol use. In a separate analysis of the two Type D personality subscales, NA contributed more than SI to sleep problems. The unadjusted logistic regression analysis of sleep hours during school nights indicated that Type D personality was associated with increased odds of sleeping fewer hours on school nights ($OR=2.314$; $95\% CI=1.938-2.763$; $p < .001$). However, the main effect of Type D personality disappeared when we adjusted the model for control variables. In contrast, Type D personality was associated with increased odds of sleeping fewer hours in the weekend nights, in both the unadjusted model ($OR=1.683$; $95\% CI=1.355-2.090$; $p < .001$), and in the model that was adjusted for the control variables (Type D personality: $OR=1.574$; $95\% CI=1.252-1.980$; $p < .001$).

Discussion

The results suggest that adolescents with Type D personality are prone to ill-health expressed as psychosomatic symptoms, musculoskeletal pain and sleep problems. In this sample, 10.4% of the boys and 14.6% of the girls were classified as Type D personality. Other studies have presented a higher prevalence of type D personality in adolescents, including 18.2 % in a study of Korean adolescents with a mean age of 14.3 years old [43], and as high as 27.5% in a Dutch study of subjects with a mean age of 10.3 years old [41]. Because there is a definite difference in the mean age of participants across these studies, it is not possible to make direct comparisons. However, we can assume that the prevalence of Type D personality tends to be lower in Swedish adolescents.

Green has suggested that psychosomatic symptoms are caused by psychosocial factors, such as stress and lack of social support [50]. The characteristics of social inhibition might be a mediating factor for the associations between psychosocial stress and psychosomatic symptoms. It is possible that associations between Type D personality and adolescents' psychosomatic symptoms are partially attributable to less effective strategies for coping with stress. Type D personality has been associated with repressive coping [29], avoidance coping and low levels of problem-focused coping [51]. The suppression of emotions associated with repressive coping-strategies may lead to other symptoms instead. The girls in the present study reported having significantly more musculoskeletal pain and psychosomatic symptoms than did the boys, which is consistent with previous studies [52, 53], and it has been suggested that the triggers of pain differ between boys and girls [54]. Boys often state that pain is triggered by physical exertion, whereas girls often state that pain is triggered by a common cold or internal factors such as anger disputes, family circumstances or sadness [54]. Anger and sadness are closely related to NA, and previous studies have shown that women seem to have lower pain thresholds, higher pain ratings and a lower tolerance for pain [55]. This could explain some of the differences in the prevalence of symptoms in paper I. Endorsing musculoskeletal pain may be a simultaneous expression of mood and musculoskeletal pain, which could lead to increased muscle fatigue, weakness and decreased endurance. It was not just that girls reported more musculoskeletal pain and psychosomatic symptoms, they were also more likely to have Type D personality. Adolescents with Type D

personality are more distressed than other adolescents, and the vulnerability associated with this personality type may affect their experience of pain.

The adolescents with Type D personality in this sample reported more sleep problems, than did the other adolescents. Optimal sleep allows for the physiological unwinding of the stress hormone system [56]. Studies have suggested associations between sleep and activity in the hypothalamic pituitary adrenocortical (HPA) axis [57, 58]. The HPA axis is activated in response to stress through central processes that lead to increases in circulating cortisol [57, 59]. Poor sleep quality is associated with social factors such as difficulty in dealing with problems, increased anxiety and tension, behavioral problems, and stress [60]. In one study, adults with sleep problems experienced lower quality of life and higher scores on measures of depression, anxiety, neuroticism, extraversion and stress perception, relative to good sleepers [61]. Generally, individuals with sleep problems are more likely to report a range of health problems [62], and adults with pain-related disorders also reported increased sleep problems [63, 64]. Buckner reported that many patients with insomnia had an anxious and avoidant profile [65], which is similar to individuals with Type D personality. Specifically, social anxiety has been correlated with sleep dissatisfaction, sleep-related functional impairment, and the perception of and distress about sleep problems [66]. Depressive symptoms seem to mediate the relationship between social anxiety and insomnia [65]. Poor sleep has been related to reduced physical, social, and emotional functioning in adolescents with persistent pain [67]. Sivertsen et al suggested that insomnia in adults is associated with a range of conditions, especially mental conditions and pain conditions with uncertain etiology, such as musculoskeletal pain and psychosomatic symptoms [68]. In the above studies, traits similar to those of Type D personality are associated with sleep problems. Poor sleep that manifests at a young age may have a significant impact on an individual's general health in adulthood.

Individuals with Type D personality regard ambiguous or neutral situations as more distressing than do non-Type D individuals. This perceptual bias of Type D individuals likely increases their vulnerability to stress [69, 70]. It seems plausible that the subjective experience of sleep problems may have a mediating effect on psychosomatic symptoms and musculoskeletal pain. Are Type D adolescents with sleep problems more vulnerable to the negative health effect that may be associated with through their heightened sensitivity to stress? Or do high levels of negative affectivity and social inhibition increase subjective experiences of sleep problems? For example, people with Type D personalities, are more

likely to interpret life events, symptoms of pain and sleep problems more negatively than those with non-Type D personalities and they report more of these [71].

Research on behavioral mechanisms shows that healthy individuals with a Type D personality perform fewer health-related behaviors than do non-Type D's [72-74] Michal et al showed that adults with a Type D personality displayed more help-seeking behavior compared to their non-Type D peers, despite being more bothered by not having someone to turn to when faced with problems [75]. Shiffer demonstrated that patients with Type D personality are less likely to report their symptoms to medical staff [73]. Moreover, individuals with Type D possess a distinct profile of illness beliefs, such as believing their illness will last longer, is less under their control and is less treatable [74], which may, in part, explain the link between Type D personality and health-related behavior. The expression of emotions is an important part of interpersonal communication.

Risk factors for ill health, such as negative affectivity, social inhibition, musculoskeletal pain, psychosomatic symptoms and sleep problems tend to cluster and a combination of these factors may increase the risk of ill health. Individuals with Type D personality reported more sleep problems, more psychosomatic symptoms and more musculoskeletal pain. Sleep problems may increase the risk of psychosomatic symptoms and musculoskeletal pain, as well as worsen already existing problems. On the other hand, suffering from pain and dealing with psychosocial stress may affect your sleep.

Type D personality or Negative affectivity?

Negative affectivity seems to be of most important factor in associations between Type D personality, psychosomatic symptoms, and musculoskeletal pain and sleep problems. Other studies have examined Type D personality and coronary heart disease and have also reported that NA contributed the most [76, 77]. Coyne et al. [76], suggested that the NA scale should be replaced with a depression scale based on the similarities between them. However, several studies have shown that although Type D personality is associated with an increased risk of depression, these factors are not interchangeable [78, 79]. Not only must the effects of morbid diseases be considered, but we must also consider effects of different emotional states.

However, personality consists of different traits that should not be affected by states such as depression [1]. According to Svansdottir [78] NA and SI shared considerable variance in depression/stress scores, indicating the effect of Type D personality. Other researchers have also found that the interaction of NA and SI predicted increased stress levels [80]. The Type

D personality and its two sub-traits are probably associated with psychosomatic symptoms, musculoskeletal pain and sleep problems through biological factors as well as through health behavior. Biological factors mainly affect how an individual's dominant traits influence how he or she experiences stressful situations and the physiological responses that follow. We can assume that the health behaviors associated with Type D personality are counterproductive. Type D personality has been related to emotional distress [81], and thus the etiology of psychosomatic symptoms and sleep problems may be rooted in emotional distress.

Methodological considerations

The major strength of the SALVe 2008 material is the large population-based design. The study solicited information from all of the students in the target population who were in school on the day of the investigation, as well as a number of late-responders. The study population includes adolescents from the town as well as from the countryside and can probably be considered representative of Swedish society. These factors increase the generalizability of the results to other adolescent populations.

However, the findings must be considered in the light of several limitations.

Self-report questionnaires

Self-report questionnaires always involve a risk of information bias associated with false and otherwise inaccurate responses or recollections of the participants. Although self-reports must be interpreted carefully, the accuracy of self-reports increases with age, and in adolescents they are thought to be more reliable than the self-reports of younger children [82]. An additional way to investigate the credibility of the answers would have been to use parent-reports about their adolescents for the DS14 items. In fact, Connelly et al. showed that observers' ratings of personality predict performance behaviors better than self-rated questionnaires [83]. An even more desirable way to study these phenomena may be to use a triangular method; that combines self-reports with parental ratings and results from examinations made by qualified personnel [84]. Moreover, the DS14 has two so-called "reversed questions", that allow us to reduce the effects of deliberately false answers somewhat. It has been demonstrated that response formats with several possible answers have better psychometric properties than dichotomous formats [85]. Individuals with Type D personality generally seem to complain more about somatic symptoms [22, 23], even among young people [41]. For example, an individual with Type D personality is more likely to interpret life events, symptoms, pain and sleep problems more negatively and report more of

these [71]. This is a problem when using self-reported measures with Type D individuals, because there is a risk of overestimating negative symptoms.

Another limitation is the possibility of confounding influences by medical conditions or diagnosis that were not measured. The presence of other symptoms and diseases may have affected the results. In addition, the nature of the school population may be a limitation in itself, as students with the most psychosomatic symptoms, musculoskeletal pain and sleep problems are more likely to be absent from school. However, teachers distributed questionnaires to the missing students, and this late respondent group did not differ from the rest of the students with the respect to the prevalence of Type D personality. Nevertheless, the late respondent group had significantly more sleep disturbances and slept less on school nights. Bad sleep quality may be one reason for their absence from school when the questionnaire was administered. Also, given their inhibited nature and passive coping style, it is possible that Type D individuals were less likely to participate in the study than were non-Type D individuals [86].

The cross-sectional design

The cross-sectional design precludes determining the directionality of the association between Type D personality and the outcome variables. However, personality is supposed to be stable over the course of one's life events [87], therefore it seems plausible that Type D personality lead to the psychosomatic symptoms, musculoskeletal pain and sleep problems observed in these studies and not the other way around.

Weaknesses with the DS14

A major limitation in the papers of this thesis is that the DS14 was developed for adult patients with ischemic heart disease. Adolescents undergo dramatic biological, psychological, and social transformations as they grow into adulthood. Accordingly, there may be differences in the interpretation and psychological meaning of the DS14 when it is used on adolescents. Although the DS14 was used to investigate healthy young adults in a previous study [43], the clinical utility of the Type D personality has not been established for adolescents. According to Caspi [88], the Big Five personality dimensions can be measured in childhood and adolescence because "the child is the father of the man" p.158 [89]. However there is evidence of a trend toward lower scores on neuroticism in adolescence compared with adulthood [90]. This could explain the low prevalence of Type D personality in our population.

The most frequently debated aspects of the Type D personality is validity of the scales used to measure it [91]. Coyne pointed out the lack of validity in the early studies of type D personality largely because of their small sample sizes and the associated low statistical power [92]. The study for the present thesis has a large sample size and relatively high rate of participation which gives an substantial statistical power. Moreover, O'Dell et al. [93] and Grande [94] recommended investigations by diverse groups of unaffiliated scientists (outside of the Denollet Tilburg group), to facilitate development of research on the Type D personality. Dennemann recommended additional research regarding the cut-off point of Type D personality [95]. When continuous variables are grouped into dichotomous categories, there is a risk of losing information. Therefore some researchers prefer to use continuous measures of NA and SI analyses [76, 96]. Coyne [92] highlighted a problem associated with isolating the high NA/high SI quadrant to construct Type D personality because NA and SI are moderately correlated, so patients who are selected because they score highly on both of these variables are likely to be in greater distress than if either variable were considered separately. Ferguson et al. concluded that the distressed personality type is more appropriately measured along a continuum rather than as a categorical variable based on values > 10 that assigns individuals into Type D or non-Type D categories [97]. Furthermore, there have been suggestions that Type D personality research should focus on the additive and multiplicative effects of NA and SI [92]. Thus, paper I, which examined relationships between Type D personality, musculoskeletal pain and psychosomatic symptoms, tested for the interaction effects of negative affectivity and social inhibition (measured as continuous variables z-transformed) in the correlations as well as in the logistic regressions. Using z-transformed scores in the analysis makes it easier to compare values from different distributions, but information is lost about individuals on the tails of the distribution- in the present study, those with the most negative affectivity and the most social inhibition.

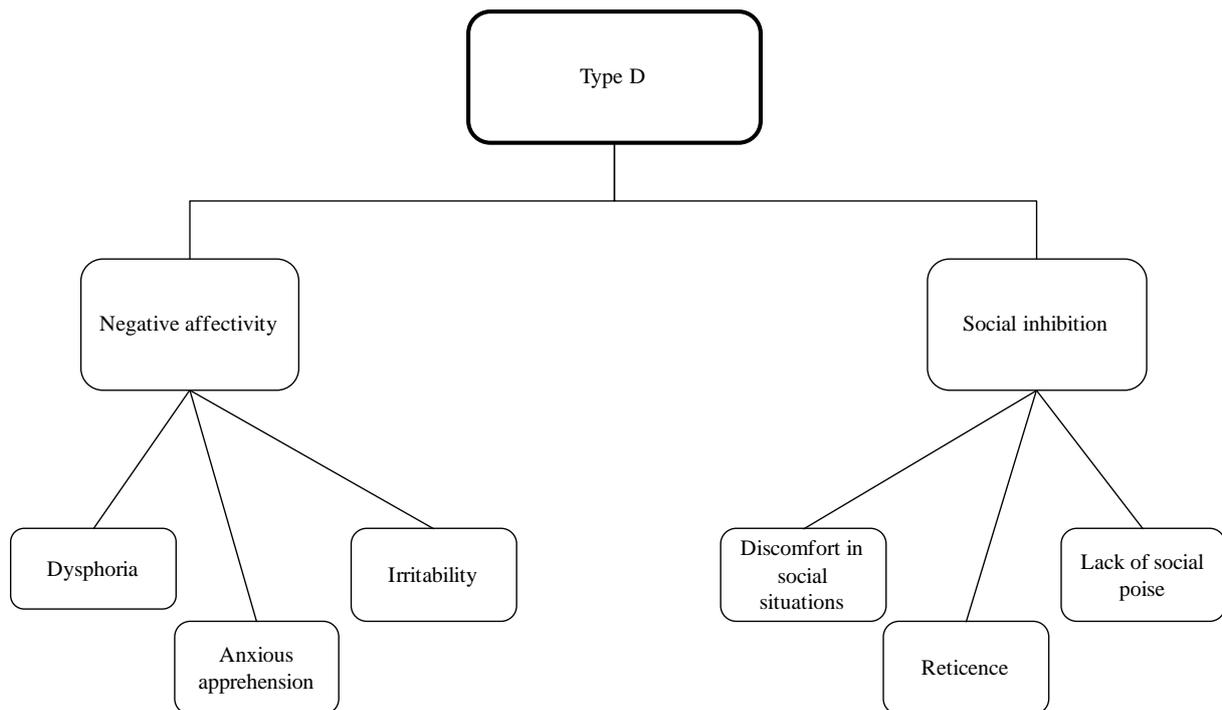


Figure 2. Adapted from Straat et al., *Journal of Psychosomatic Research* 72 (2012)

Straat et al. [98] described the NA and SI sub-trait triplets. This position supports the three-level model as the candidate theory to explain Type D personality. By the use of exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and Mokken analysis, Straat assessed the internal structure of the DS14 [98]. According to the CFA method, the results suggested support for a three-level hierarchical model. However, the EFA- model suggested a two-factor structure without evidence for the low-level factors. Straat [98] stated that the three-level hierarchical model is the conceptual model for the Type D personality.

Other studies have indicated quite stable reliability of the DS14 scale in terms of Cronbach's α [29, 36]. Our measures also indicate good reliability with Cronbach's $\alpha = 0.864$ for the NA scale, and 0.786 for the SI scale.

As only a few analyses were performed and considering the large sample size, the risk of finding significant results by chance because of making multiple comparisons is likely to be small. Given the number of control variables we could have used Bonferroni corrections to minimize the likelihood of Type I errors, but then we would have had a greatly increased risk of Type II errors [99].

Conclusions

More than every tenth adolescent was classified as Type D personality. Those adolescents with Type D personality are prone to musculoskeletal pain, psychosomatic symptoms and sleep problems, and it may be beneficial to identify such adolescents (through target behavioural interventions) to decrease not only the stress they may be suffering, but also lower the negative emotions they experience. However, we must be aware that individuals with increased negative emotions do not share their emotions easily with others because of fears of rejection or disapproval. NA and SI are not new personality traits, but their additive effects in the Type D personality scale contribute new knowledge to the research field. As Type D personality seems to be more common among adolescent girls, as are the difficulties represented by the outcome variables in this thesis, girls may deserve special attention. These studies provide a new understanding of adolescents with Type D personality and the negative effects it has on health. Relative to other personality scales, the DS14 is an easy tool to use with a broad range of clinical applications. Efforts must concentrate on symptom relief and stress reduction for individuals with Type D personality.

Future studies

With these studies we have described the importance of Type D personality for the daily life and health of adolescents. However, discussions about the development of personality, its stability and possibilities for change still need to be addressed. The extent to which personality changes over time, with illness or stress, or in response to interventions, therapies and treatments needs examination given that the personality traits are considered to be stable and enduring patterns of feelings, thoughts and behaviors. The typical cognitive and affective processes of the Type D personality need to be studied in longitudinal research in addition to cross-sectional studies. Because individuals with Type D personality tend to use maladaptive coping strategies, interventions seem especially appropriate for these individuals to improve their health. A longitudinal approach would help us better understand the causal relationships between sleep and Type D personality, and possible impacts on health. Moreover, Type D personality and the DS14 scale have not yet been validated in Swedish patients with cardiovascular diseases. It would be interesting to investigate whether Type D personality is more common among individuals with myocardial infarct in an adult Swedish population.

Svensk sammanfattning

Typ D personlighet eller ”The distressed personality” kännetecknas av både förhöjd Negativ affekt (NA) och Social hämning (SI). NA är tendensen att uppleva negativa känslor, och SI är tendensen att vara hämmad i sina uttryck av känslor i samvaro med andra människor. Flera tidigare studier har påvisat samband mellan typ D personlighet och ett ökat antal hälso och somatiska besvär, låg självskattad hälsa, sömnproblem, ökad upplevelse av negativa känslor, och en negativ inverkan på psykisk och fysisk hälsa. Typ D personlighet mäts med självskattningsformuläret DS14. Studier som mäter typ D personlighet och dess hälso-konsekvenser hos ungdomar är dock ett outforskat område.

Studie I

I studie I undersökte vi förekomsten av typ D personlighet hos ungdomar och associationer mellan typ D personlighet, självrapporterade psykosomatiska symptom och muskuloskeletal smärta. I denna studie, kan mer än var tionde ungdom klassificeras som en typ D personlighet. Dessutom fanns ett starkt samband mellan denna personlighetstyp och både psykosomatiska symptom och muskuloskeletal smärta. Vidare rapporterar ungdomar med en typ D personlighet fler symptom. Det var dock en svagare korrelation med muskuloskeletal smärta hos både pojkar och flickor. Pojkar och flickor med en typ D-personlighet hade ett cirka 2-faldigt ökat odds för muskuloskeletal smärta och en 5-faldig ökning av psykosomatiska symptom. Underskalan NA förklarade de mesta av förhållandet mellan typ D personlighet och psykosomatiska symptom och muskuloskeletal smärta. Inga interaktions effekter av NA och SI hittades. Denna personlighetstyp, eller i synnerhet NA kan vara en viktig faktor för att öka risken att drabbas av muskuloskeletal smärta och framför allt, psykosomatiska symptom bland ungdomar.

Studie II

Mängden sömn och sömnkvaliteten är en viktig indikator på hälsa och välbefinnande bland ungdomar. Tonåren är en känslig period, under vilken många fysiologiska, kognitiva och psykologiska processer mognar. Dåliga sömnvanor etableras ofta under ungdomen, och kan få senare konsekvenser. Huvudresultatet var att typ D personlighet var associerat med ökade sömnproblem hos ungdomar. Ungdomar med typ D personlighet hade fyra gånger ökad odds för sömnstörningar. Dessutom var typ D personlighet associerat med att sova färre timmar. Dessa individer är särskilt utsatta för de negativa effekterna av den allmänna stressen. Dessa

egenskaper kan ha stor betydelse för sömnkvaliteten, och kan vara en möjlig förklaring till sambanden mellan typ D personlighet och ökade sömnproblem bland ungdomarna. Dessutom kan stress vara en medierade faktor mellan typ D personlighetsegenskaperna och sömnproblemen.

Ungdomar med sömnproblem kan uppleva psykosomatiska symptom och muskuloskeletala smärtor värre då sömnproblem sänker stresståligheten. Studier har även visat att individer med Typ D personlighet kan uppleva situationer som andra upplever som neutrala som stressande. De negativa känslorna som individer med Typ D personlighet upplever är den underskala av Typ D personlighet som påverkar psykosomatiska och muskuloskeletala symptom och sömnproblem mest. Då tonåren är en formativ period för utveckling är det viktigt att identifiera sömnstörningar tidigt. Vidare påverkas individer med typ D personlighet mer negativt av stress och uppvisar sämre coping strategier vilket kan få negativa hälsoutfall. Individer med typ D personlighet skattar sin hälsa generellt sämre än andra. Den självupplevda hälsan är dock inget att ignorera då individers upplevelse av sin egen hälsa har kopplats till både hälsostatus och hälsoutfall.

En person med typ D personlighet är mer benägen att tolka händelser i livet, symptom, smärta och sömnproblem mer negativt än en icke-typ D person och rapportera mer av dessa, detta kan påverka resultaten i studierna.

Konklusion

Mer än var tionde ungdom klassificerades som typ D personlighet. Typ D personlighet kan vara en betydande faktor för att öka risken för att drabbas av muskel-, och framför allt, psykosomatiska symptom och sömnproblem bland ungdomar. Typ D personligheter är särskilt känsliga för effekterna av stress. Förekomsten av typ D personlighet förknippad med dålig sömn kräver uppmärksamhet eftersom sömnproblem kan vara ett tidigt stadium i utvecklingen av senare sjukdomar.

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