

**The role of personality in stress, burnout and help-seeking.
A ten-year longitudinal study among Norwegian medical students
and early career physicians**

Jan Ole Røvik



**Department of Behavioural Sciences in Medicine
Faculty of Medicine
University of Oslo
2009**

© Jan Ole Røvik, 2010

*Series of dissertations submitted to the
Faculty of Medicine, University of Oslo
No. 894*

ISBN 978-82-8072-372-7

All rights reserved. No part of this publication may be reproduced or transmitted, in any form or by any means, without permission.

Cover: Inger Sandved Anfinsen.
Printed in Norway: AiT e-dit AS, Oslo, 2010.

Produced in co-operation with Unipub AS.
The thesis is produced by Unipub AS merely in connection with the thesis defence. Kindly direct all inquiries regarding the thesis to the copyright holder or the unit which grants the doctorate.

*Unipub AS is owned by
The University Foundation for Student Life (SiO)*

Summary	5
Acknowledgements	8
Aims of the thesis	11
1 Introduction	12
1.1 Perceived stress and its long-term effect among physicians.....	12
1.1.1 Job stress.....	13
1.1.2 Perceived medical school stress.....	15
1.2 Burnout among physicians.....	16
1.3 Mental distress, treatment needs.....	17
1.4 Help-seeking.....	17
1.5 Personality.....	18
2 Research questions	21
3 Materials and methods	22
3.1 Study design.....	22
3.2 Participants.....	23
3.2.1 The medical student cohort.....	23
3.2.2 The young physician cohort.....	24
3.2.3 The general working population cohort.....	25
3.3 Dependent variables.....	25
3.3.1 Perceived job stress.....	25
3.3.2 Mental distress.....	26
3.3.3 Perceived medical school stress.....	27
3.3.4 Burnout.....	27
3.3.5 Help-seeking.....	28
3.4 Independent variables.....	30
3.4.1 Demographic characteristics.....	30
3.4.2 Personality traits.....	30
3.4.3 The Torgersen personality typology.....	31
3.4.4 Work characteristics.....	32
3.4.5 Support.....	32
3.4.6 Perceived level of mental health problems.....	33
3.5 Statistical analyses.....	33
3.6 Methodological issues.....	34
3.6.1 Study design.....	34
3.6.2 Attrition.....	35
3.6.3 Limitations.....	37
3.7 Ethics.....	37
4 Results and summary of the papers	38
4.1 Paper I:.....	38
4.2 Paper II:.....	39
4.3 Paper III:.....	40
4.4 Paper IV:.....	41
4.5 Paper V:.....	42
5 General discussion	44
5.1 Stress.....	44
5.2 Help-seeking.....	47
5.3 Personality and stress.....	48
5.4 Other predictors of stress.....	54

6 Conclusions and implications.....	56
Appendices.....	59
Appendix A.....	59
Appendix B.....	60
Table 1 Dependent variables, with points of measurement	29
Table 2 Torgersen’s personality types, student and young doctor cohorts	31
Table 3 Personality dimensions, stress and help-seeking, present study	50
Table 4 Levels of BCI personality traits in different samples.....	52
Table 5 Stress in the Torgersen’s personality types, present and earlier studies	53
Figure 1 Theoretical model	20
Figure 2 Overview of the study: assessments and response rates.....	22
Figure 3 The medical student cohort.....	24
Figure 4 The young physician cohort.....	25
Figure 5 Revised model with the variables of the present study entered.....	43
Figure 6 Development of stress dimensions among the physicians.....	46

Summary

Background

Previous research has shown elevated levels of stress among physicians compared to the general population and other academics, and emotional pressure and demanding patient work are associated with mental health problems. Burnout impairs physician health and well-being and patient satisfaction and care, and has been pointed out as a major contributor to absenteeism and long sick leaves in physicians, thus affecting negatively health economics. Doctors tend to treat themselves and not seek help from others, thus reducing their chance of getting good treatment. There is a lack of studies with a longitudinal design that explore the development of physician stress, burnout and mental health problems through different phases of the career. The impact of personality dimensions in stress among doctors has been explored in a number of cross-sectional studies, but we lack knowledge on how personality dimensions interact in relation to stress.

Research questions

Against this background, the present study explored the development of perceived stress, burnout and help-seeking among medical students and doctors in their early career. Predictors and concurrent explanatory variables of stress and burnout over time were explored. Are levels of perceived burnout among Norwegian physicians deviant from those in the general working population? The link between personality and experienced stress, burnout and help-seeking was put under scrutiny and the personality dimensions were explored: what role does the interplay between neuroticism, extraversion, and conscientiousness play in stress? Does conscientiousness moderate the stress related to neuroticism?

Materials and methods

The present thesis is based on two cohorts surveyed four times over 10 years by postal questionnaire. One cohort consisted of all the students at all four universities in Norway who started their medical education in 1993 (N = 379). The other cohort consisted of all the medical students at all the four universities in Norway who graduated in 1993 and 1994 (N = 522). Dependent variables were job stress, mental distress, work-home interference stress, burnout, and help-seeking for mental health problems in need of treatment. Personality was an ever-

present predictor in all the papers of the study. Personality was assessed with dimensions of neuroticism, extraversion, and conscientiousness, but personality types were also used, based on dichotomization of the dimensions. Predictors also covered stressors, support, working conditions and autonomy. The longitudinal design enables the study of development of stress over time and also allows prediction over time to discover possible risk factors. A random sample of the general Norwegian working population (N = 1001) was used for comparison of burnout levels.

Results

The level of perceived medical school stress was on a modest level of 2.5 on a scale from 1 to 5, and did not change from the third to the sixth year in the medical student cohort. Women reported higher level of overall perceived medical school stress than men. The level of emotional pressure, time pressure, fear of complaints, and work-home interference stress started off in internship at about 2.5 on a scale from 1-low to 5- high. The level of emotional pressure, time pressure and fear of complaints decreased from the fourth to the 9th postgraduate year, whereas the level of work-home interference stress increased in the same period. The level of emotional exhaustion was higher than amongst the general working population, and did not change significantly throughout the first eight postgraduate years. The level of treatment-needing mental health problems increased from the first to the fourth postgraduate year, from 11% to 17% with no subsequent augmentation of help-seeking.

The personality traits of neuroticism and conscientiousness predicted independently perceived medical school stress. Neuroticism, work-home interference and lack of colleague support predicted emotional exhaustion in an adjusted model. High levels of reality weakness were independently associated with low degree of help-seeking. As regards personality types, “Brooders”, with a combination of high neuroticism and high conscientiousness, were the most prone to report perceived stress, both in the medical curriculum and in the 1st postgraduate year. “Hedonists” on the other hand, with low neuroticism and low conscientiousness, were the least prone to report stress in the medical curriculum and in the 1st postgraduate year. Neuroticism, together with high or low

conscientiousness, as well as low support, predicted stress related to balancing work and home life in young doctors.

Conclusion

Medical school stress persisted from mid-curriculum to the last year, stress related to demanding patient work declined, and stress related to the work-home interference increased in the first nine postgraduate years. Burnout levels were on a somewhat elevated level compared to the general working population. Male physicians compared were more burnt out than other male academic workers. A combination of high neuroticism and high conscientiousness is unfavourable with regard to stress, and reality weakness is associated with low help-seeking.

Acknowledgements

I am grateful for all the excellent support I have received in my years at “Atferdsfag” (Behavioural Sciences in Medicine). There have always been open doors to colleagues to ask about large and small statistical, methodological and substantial matters to hand. This has been both stimulating and reassuring. Firstly I thank my main supervisor, Reidar Tyssen, who has taught me a lot about being a researcher and who has been very patient with me at a time when my growing family has also taken my attention. He has also been a good companion on trips abroad to diverse research conferences. I thank my wife Anna and my three wonderful girls, Frida Marie, Ellisiv, and Andrea, for their patience with me during these working years. A special thanks to Professor Per Vaglum, who inspired me in the first place to pursue academic goals. He was first my supervisor in psychotherapy, and continued to guide me in my academic writings. Professor Øivind Ekeberg has also been an important assisting supervisor, with a clear eye for the goals ahead – thanks. A thankyou to Professor Torbjørn Moum for his ever-helpful attitude, never saying no when asked to advise on a statistical matter. Professor Tore Gude has been equally supportive. I also thank the other seniors at the department, as well as fellow researchers. Postdoc fellow Erlend Hem has been a steady hand in co-writing papers. The research meetings at Atferdsfag every Tuesday represent a strong structural element in the department and a good place to start off presenting own results. Not too dangerous, because the constructive criticism is always coupled with humanity.

Professor Olaf Aasland, at the Research Institute of the Norwegian Medical Association, has been important in planning and implementing the study from its beginning. Associate Professor Magne Thoresen, at the Department of Biostatistics, has been a valuable contributor in advising on advanced statistics. Professor Erik Falkum has contributed with data from the general working population and as a co-writer.

I am grateful for the aid of EXTRA funds from the Norwegian Foundation for Health and Rehabilitation, and the foundation Almus in Oslo. Berit Bakken, the secretary of our department, has been a steady rock, always there for me: I am grateful for her helpfulness.

And thanks for this –, the unspoken agreement and belief that we will come through, even when I doubt it myself. There has also been a good competitive atmosphere, in which all are welcome to succeed, but not at the expense of others. What then is the meaning of it all? For me, it must be to make some contribution to a better world by finding out something that can make the lives of physicians and their patients better.

List of papers

- I Røvik JO, Tyssen R, Gude T, Moum T, Ekeberg Ø, Vaglum P.
Exploring the interplay between personality dimensions: A comparison of the typological and the dimensional approach in stress research. *Personality and Individual Differences* 2007;42:1255–66.
- II Tyssen R, Dolatowski FC, Røvik JO, Thorkildsen RF, Ekeberg Ø, Hem E, Gude T, Grønvold NT, Vaglum P. Personality traits and types predict medical school stress: a nationwide longitudinal study. *Medical Education* 2007; 41:781-7.
- III Røvik JO, Tyssen R, Hem E, Gude T, Ekeberg Ø, Moum T, Vaglum P.
Job Stress in Young Doctors, with Emphasis on the Work-Home Interface. A Nine-Year Nationwide and Longitudinal Study of Course and Predictors. *Industrial Health* 2007; 45: 661-70.
- IV Røvik JO, Tyssen R, Hem E, Gude T, Falkum, E, Ekeberg Ø, Vaglum P.
Emotional Exhaustion among Early Career Physicians: A nationwide nine-year longitudinal and comparison study of levels and predictors. Submitted.
- V Tyssen R, Røvik JO, Vaglum P, Grønvold NT, Ekeberg Ø. Help-seeking for mental health problems among young physicians: is it the most ill that seeks help? *Soc Psychiatry Psychiatr Epidemiol* 2004;39:989-93.

Aims of the thesis

1. To explore the level and development of perceived stress among medical students and early career physicians. The stress measures include perceived medical school stress, work-related stress, and mental distress.
2. To study the role of personality in relation to stress with both a dimensional and typological approach.
3. To study the level and development of burnout and contextual predictors.
4. To study treatment needs for mental health problems and predictors of help-seeking among medical students and young physicians.

1 Introduction

1.1 *Perceived stress and its long-term effect among physicians*

A well-functioning physician is essential for good quality patient care, but high prevalence of job-related stress and mental health problems among doctors may be a threat to good medical practice. The relation between work stress and mental health problems has gained increasing attention in research in later years (Michie & Williams, 2003). Doctors as well as other human-services professions are presumably at risk of developing stress reactions, mental health problems, depression, suicide mortality, burnout and long-time sick-leaves (Hsu & Marshall, 1987; Wall et al., 1997; Michie & Williams, 2003; Eriksen et al., 2003; Kivimaki et al., 2001; Tyssen et al., 2000; Schernhammer & Colditz, 2004; Lindeman et al., 1996; Hem et al., 2004; Tyssen, 2007). An association between burnout and long-time sick-leave has been demonstrated in recent studies (Toppinen-Tanner et al., 2005; Ahola et al., 2008), and also among health care workers, including doctors (Peterson et al., 2008).

The concept of stress has been subject to a vast amount of research from the 20th century onwards. The pioneering Walter Cannon (Cannon, 1932) described how the internal homeostasis may be disrupted in the individual's struggle for adaptation and survival (1932). The 'fight or flight' reactions he described, with the accompanying emotions of anger and fear, may endanger the internal stability, creating physiological stress and potential for adverse effects on the individual's health. The main view of that time was that stress was external, stimulus-based, something happening to the individual rather than being caused by the individual. Picking up on Cannon's work, Hans Selye advocated a response-based model of stress in which he described the General Adaptation Syndrome (Selye, 1956). He described a broad range of physiological defences against physical stressors in his research on rats, with three stages of response: alarm, resistance and exhaustion. Central in this model was the body's urge to restore homeostasis as disrupting forces or agents threaten health. Selye's model was, however, criticised for being too unspecific. Thus, in his later works, Selye focused more on the psychological level of the stress response and he broadened his definition of stress to a more

inclusive one: “the non-specific response of the body to any demand made upon it” (Selye, 1974).

Questions about what mechanisms determine the magnitude or intensity of the stress response in a given situation remained unanswered, likewise the question of individual differences in stress response to a given stimulus. These questions stimulated the development of integrative models where both stimulus and response were integrated together with the psychological perspective (Lazarus, 1966). Stress involves the judgement that environmental or internal demands tax or exceed the individual’s resources for managing them (Holroyd & Lazarus, 1982).

High levels of stress in doctors and medical students has been addressed by several researchers (Firth-Cozens, 1987; Butterfield, 1988; Evans et al., 2004; Baldwin et al., 1997a; Hsu & Marshall, 1987; Tyssen & Vaglum, 2002; Tyssen et al., 2000). Stress in doctors is important since it may have adverse effects on the health of the physicians themselves. Doctors, as human services professionals, are at risk of developing unhealthy stress reactions, with resulting somatic and mental health problems, burnout and long-time sick leaves (Eriksen et al., 2003; Kivimaki et al., 2001; Langballe et al., 2008; Shanafelt et al., 2003; Dahlin et al., 2005).

Deterioration in the quality of patient health care may also result (Mitchell et al., 2005). Several studies show relatively high levels of stress among women in medicine (Aasland et al., 1997; Buddeberg-Fischer et al., 2008; Firth-Cozens, 1990; Gjerberg, 2003; Dahlin et al., 2005). Furthermore, some studies show that gender influences doctors’ career and performance in medicine (Buddeberg-Fischer et al., 2008; Gjerberg, 2003; Miller & Clark, 2008).

This thesis uses a model of stress where both stimulus (stressor) and response (perceived stress) are incorporated, together with intervening variables such as personality traits and possible other predictors in a longitudinal design.

1.1.1 Job stress

Early models of job stress included organisational characteristics of the workplace together with individual differences and social relations at work to explain stress in the individual (French & Kahn, 1962). This model has had an impact on later development in the work stress research by defining and proposing potential stressors, including conflict, overload and moderators, such as social support.

However, the model turned out to be too simple to explain the complexity of stress at work (Hurrell Jr et al., 1998). The Person-Environment Fit model, developed in the 1970s, states that stress arises from a misfit between the demands of the job and the motives and abilities of the person to meet those demands (Caplan et al., 1975; Van Harrison, 1978; Baker, 1985).

Karasek and Theorell elaborated further on the job characteristics and distinguished between demand and control in their widely known Decision Control Model (Karasek & Theorell, 1990). According to this model, psychological demands alone do not necessarily lead to stress, but the combination of high demands and lack of decision latitude might do so. The support dimension was supplemented in the Demand Control Support model, which postulates that the stressing effect of the combination of high demands and low decision latitude is more prominent under conditions with low support. (Johnson & Hall, 1988; Johnson et al., 1989; Karasek & Theorell, 1990). However, personality characteristics are not integrated into this model.

Several studies among doctors have shown high levels of work-related stress in their early career (Hsu & Marshall, 1987; Reuben, 1985; Kapur et al., 1998), but less is known about stress levels further on. High levels of emotional pressure have been reported in cross-sectional studies (Baldwin et al., 1997a; Firth-Cozens, 1987; Cooper et al., 1989; Hsu & Marshall, 1987; Tyssen & Vaglum, 2002). Time pressure has been broadly investigated in cross-sectional studies (Cooper et al., 1989; Richardsen & Burke, 1991; Tyssen et al., 2001a; Falkum, 1996). Several studies have described the levels of reported stress in internship (Hsu & Marshall, 1987; Reuben, 1985; Kapur et al., 1998). Few studies have investigated job-related stress with a longitudinal design in the early career of doctors and studied development of stress over many years (McManus et al., 2004).

1.1.1.1 Work-home interference stress

The relationship between work and family life has been subject to intensive research over the last couple of decades. Although the relationship between work and family life is reciprocal, a majority of research has shown that work demands negatively affect family life, rather than the opposite (Bond et al., 1998; Frone et al., 1992; Peeters et al., 2005). The role stress theory, first formulated by

Greenhaus & Beutell (Greenhaus & Beutel, 1985), assumes that stress results from fulfilling different roles in the work and family domains that in some respect are incompatible with regard to time, strain or behaviour. More recently, the more comprehensive ecological systems theory (Grzywacz & Marks, 2000) has taken into account the person as well as context and time in the work-home interference process. Resources at work (e.g. support from co-workers and supervisors) as well as at home (e.g. spouse support) would lower the negative spillover and enhance positive spillover between work and family in this theory. Pressure at work as well as home would enhance negative spillover and lower positive spillover between work and family.

The impact of personality has been examined in some studies. Higher levels of neuroticism were found to correlate with more negative work-home interaction, whereas extraversion correlated to less negative spillover between the two domains (Grzywacz & Marks, 2000). Demerouti found conscientiousness to have a moderating role between job flow (job involvement) and job performance, with job involvement giving better performance only in conscientious employees (Demerouti, 2006). However, we lack longitudinal studies on the development of work-home interference over the postgraduate years in medicine, and also studies that explore the predictors of and possible risks factors for such stress.

1.1.2 Perceived medical school stress

There have been numerous studies on stress among medical students, and perceived medical school stress has been targeted in research for several reasons. Medical students report perceived stress from academic pressures, social issues and financial problems that may result in mental health problems (Vitaliano et al., 1984; Bramness et al., 1991; Dahlin et al., 2005; Dyrbye et al., 2006; Guthrie et al., 1998; Radcliffe & Lester, 2003; Niemi & Vainiomaki, 2006). One recent Swedish cohort study of medical students found that 27% had a psychiatric diagnosis (Dahlin & Runeson, 2007). However, there are few longitudinal studies, and few have studied the link between personality and medical school stress. To our knowledge, none has explored the predictive role on such stress of both personality trait dimensions and personality typology in a representative sample of medical students.

1.2 Burnout among physicians

Burnout research started off in the 1970s in the human services (Freudenberger, 1975; Maslach, 1976). The Maslach burnout inventory covering the three dimensions of emotional exhaustion, depersonalisation and personal accomplishment was established in the 1980s as the most widely used burnout inventory and it also became validated in physician cohorts (Rafferty et al., 1986). Job stress results from job demands that exceed the person's adaptive resources, and refers to the temporary adaptation process, together with mental and physical symptoms. However, the final stage may be burnout, when adaptation breaks down as a result of prolonged imbalance between demands and resources and function may be impaired (Brill, 1984). Burnout may also be distinguished from job stress in the development of negative attitudes and behaviours towards recipients and the job; this is not necessarily the case in stress (Maslach & Schaufeli, 1993). Furthermore, burnout should also be differentiated from depression, although there is a relatively high correlation between emotional exhaustion and depression. The latter is more associated with negative life events and life stress in general. Research on burnout increased in the 2000s, with more than 2600 articles published in Medline since 2000 (April 2009). However, relatively few studies have been conducted specifically on physicians in their early career, despite the exposure to heavy demands in this professional group which could put them at risk of developing burnout, as pointed out by Prins and Niku (Prins et al., 2007; Niku, 2004). Apart from a few studies (McManus et al., 2004; Cherniss, 1995; Peiro et al., 2001), there is a lack of longitudinal studies that can ascertain the causal relationship between possible predictors – or possible risk factors – and burnout (Niku, 2004). A comparison of the level of burnout among physicians with the general population could be a validation of burnout among physicians.

There are several factors that may contribute to burnout in physicians. These are based mainly on cross-sectional studies and they include workload (Shanafelt et al., 2002; Cooper et al., 1989; Freeborn, 2001), personality (McManus et al., 2004; Kash et al., 2000; Lemkau et al., 1988), lack of autonomy (Campbell et al., 2001; McMurray et al., 2000) and work-home interference (Linzer et al., 2001; Geurts et al., 1999; Sargent et al., 2004; Campbell et al., 2001). In terms of the clinical

importance of the burnout concept, there is one large recent prospective study that links burnout to suicidal ideation among US medical students, even when controlled for depression (Dyrbye et al., 2008). Nevertheless, we lack more prospective studies that include multivariate predictor models, in order to control for confounders. Data are also required from more representative samples of medical doctors.

1.3 *Mental distress, treatment needs*

Surprisingly high levels of emotional distress have been reported among junior physicians in several studies. Firth-Cozens found a prevalence of 50% of emotional disturbance among junior house officers in the United Kingdom (Firth-Cozens, 1987). Baldwin et al. found 30% of physicians to fall into caseness category for psychiatric symptoms (GHQ-28) (Baldwin et al., 1997a). Wall et al. found 28% of physicians in the NHS in the UK to report GHQ-12 caseness for minor psychiatric disorder (Wall et al., 1997). McManus found 21% of UK physicians to report GHQ caseness in a longitudinal study (McManus et al., 2004). Hsu found somewhat higher depression rates among Canadian interns, residents and fellows than in community samples (Hsu & Marshall, 1987). An Australian study found a steady rise in prevalence of psychiatric morbidity throughout the internship (Willcock et al., 2004). But we lack studies that explore the role of personality in predicting mental distress, treatment needs and help-seeking among young physicians during a critical transitional phase of the career.

1.4 *Help-seeking*

Physicians tend to treat themselves or seek advice amongst colleagues instead of using ordinary health services to ensure good treatment (Hem et al., 2005; Rosvold & Bjertness, 2002; Töyry et al., 2000a; Pullen et al., 1995), and lack of professional help-seeking may be one reason for more suicide in this occupational group. We lack studies that take into consideration how personality affects help-seeking behaviour in physicians and how this behaviour develops with time. Longitudinal studies are needed to explore which are the predictors of help-seeking in physicians, to know where to intervene in order to promote physician health through sounder help-seeking behaviour.

1.5 Personality

Research on personality and stress has its roots in studies on war stress reactions in the Second World War and thereafter. A model of neuroticism and extraversion was presented by Eysenck on the basis of factor analysis (Eysenck, 1947). People high on neuroticism experience more stressful events and more stress regardless of the level of stress. People high on extraversion, on the other hand, tend to experience more pleasurable events and more positive emotions (Watson & Clark, 1992). Later on, Costa et al. launched the 'Big Five' model including neuroticism, extraversion, conscientiousness, openness, and agreeableness (McCrae & Costa, 1989). Several descriptive models have been launched in personality research. Researchers have argued that the Big Five model is the most ideal (Costa P.T.Jr & McCrae R.R., 1995), and many studies have explored the impact of the 'Big Five' personality dimensions on stress. Neuroticism is consistently associated with stress. Reports on the effects of extraversion and conscientiousness are more inconsistent (Lee-Baggeley et al., 2005). Eysenck has launched the 'Giant Three' model, which includes neuroticism, extraversion and conscientiousness (low psychoticism) (Eysenck, 1994).

Torgersen and Vollrath have argued that conscientiousness, which has been associated with planning and active coping, should be included in a model of personality and stress (Vollrath & Torgersen, 2000). The two Big Five dimensions of openness and agreeableness, however, have been less strongly associated to stress and coping in other studies (Jelinek & Morf, 1995; Watson & Hubbard, 1996). According to this argumentation, a model with the Giant Three personality dimensions of neuroticism, extraversion and conscientiousness should explain the vast majority of variability in the experience of and adaptability to stress. Besides, these three traits have been found to be biologically rooted in genetics (Torgersen, 1980a). More recent lexical studies on personality, where words describing personality in natural language are analyzed, have failed to support the Big Five model in non-north European countries (Saucier & Goldberg, 2008), i.e. have not supported the cross-cultural generalizability criterion for a good structural model (Eysenck, 1991). Neuroticism, extraversion and conscientiousness seem to be the dimensions most consistently coming up in the personality models of lexical studies (De Raad et al., 1997; Szirmak & De Raad, 1994). Torgersen has also

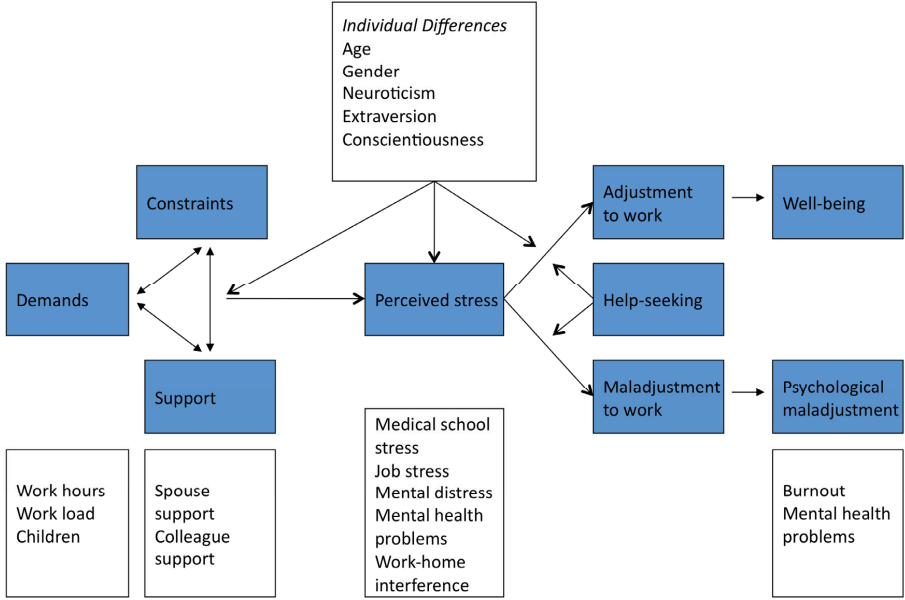
presented a fourth dimension, reality weakness, in his Basic Character Inventory (Torgersen & Alnaes, 1989). This dimension covers non-psychotic distorted perceptions of self and the outer world, exemplified in items such as 'Sometimes I seem to live in a fog'. The dimension refers to identity-insecurity, suspiciousness in relationships and chronic illusions, and is related to personality disturbances. The importance of considering the interactions among personality traits has been increasingly acknowledged in stress research. Earlier studies focused on the effects of the traits separately and found neuroticism and extraversion to be important predictors of stress. More recently, conscientiousness has been found to be associated with active coping (Costa et al., 1991) rather than with maladaptive coping. The interactions among the personality traits should therefore be considered to get a better picture of an individual's response to stressful conditions. In clinical psychology and medicine typologies have been widely used to describe groups of individuals with certain combinations of characteristics (e.g., diagnostic categories). In this way, large amounts of information are condensed under one heading and bring about descriptions of easily recognizable personality patterns.

Neuroticism is consistently found as a contributor to physician distress (Purdy et al., 1987; Daly & Willcock, 2002; Tyssen et al., 2005; Johnson, 1991).

Conscientiousness (or obsessiveness) has been considered an adaptive trait for physicians in some studies (McCue, 1985; Spickard, Jr. et al., 2002), but stress-evoking in others (Gabbard, 1985). Due to sparse research on the interplay between dimensions it would be of interest to examine how constellations of high and low levels of the Giant Three personality dimensions interact on stress levels.

Figure 1 Theoretical model

adapted after Payne & Firth-Cozens (1987) and Aasland et al. (1997)



2 Research questions

The research questions of the thesis were:

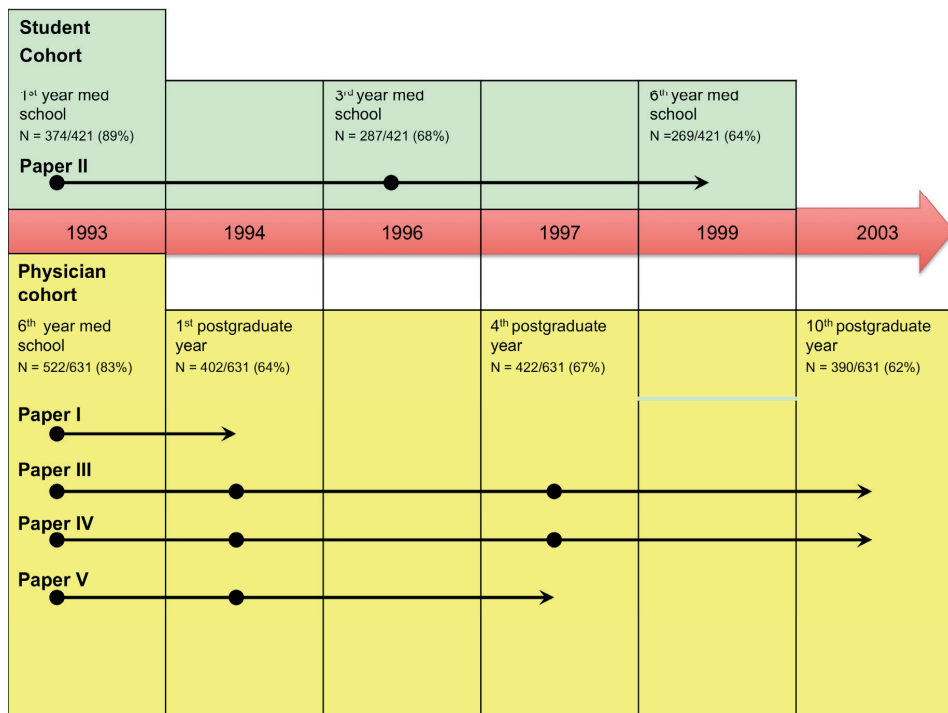
1. What are the levels and course of stress and burnout among medical students and physicians in their early career? (Paper I, II, III, IV).
2. What is the impact of personality on stress, burnout and help-seeking? How do neuroticism, extraversion, and conscientiousness play together and determine perceived stress, as seen among personality types in a typology? (Paper I, II, III, IV, V).
3. What predictors other than personality are decisive in stress, burnout and help-seeking in adjusted predictor models? Are there gender differences? (Paper III, IV, V).
4. Are physicians more burned out than the general working population? (Paper IV).

3 Materials and methods

3.1 Study design

The present thesis builds on studies conducted on two nationwide cohorts that together constitute the Longitudinal Study of Norwegian Medical Students and Physicians. These were postal surveys of a medical student sample (N = 421) and a young physician sample (N = 631). Both samples were surveyed four times from 1993 to 2003, although for the medical student cohort part only the first three assessments are part of the present study (figure 2). The sampling was prepared by visits from two of the researchers to all four universities before the first assessment. A presentation of the study was given to all the classes that were included in the study in order to give information and answer any queries from the participants. This might be partly responsible for the rather high response rates.

Figure 2 Overview of the study: assessments and response rates



In papers I, II, IV and V, predictor models with stress, burnout, and help-seeking as outcome respectively were tested with regression models. Paper III on work-home interference stress applied a longitudinal design modelled in a mixed model with repeated measures. This enabled the exploration of the developments of work-home interference over time combined with a predictor model. The prospective and longitudinal design makes it possible to sort out true predictors.

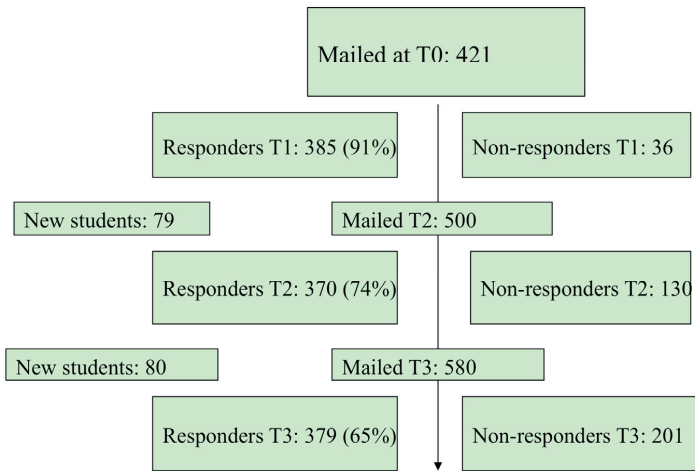
3.2 Participants

The population of the present study, the Longitudinal Study of Norwegian Medical Students and Doctors, comprises the medical student cohort and the young doctor cohort. The participants received a comprehensive postal questionnaire of 30-40 pages on each occasion. The survey included a broad range of queries on individual and work characteristics as well as issues of quality of life and mental health, thus enabling multiple research aims.

3.2.1 The medical student cohort

Participants in the medical student cohort were students starting their medical curriculum in 1993. In the autumn of 1993, all the first-year students at all four medical schools in Norway ($n = 421$) were invited to participate in a longitudinal survey spanning their six years of medical training. At baseline, in the first semester of medical school (T1), 374 (91% of the original sample) students responded. In the middle of undergraduate year 3 (T2), 287 students (77% of the baseline cohort, 68% of the original sample) responded. In the graduating term, nearly six years after the beginning of their studies (T3), 269 students (72% of the baseline cohort, 64% of the original sample) responded. The final sample consisted of 236 students who had responded on all three occasions (63% of the baseline cohort, 56% of the original sample) (mean age at T1 = 21.7 ± 2.6 years, 59% female).

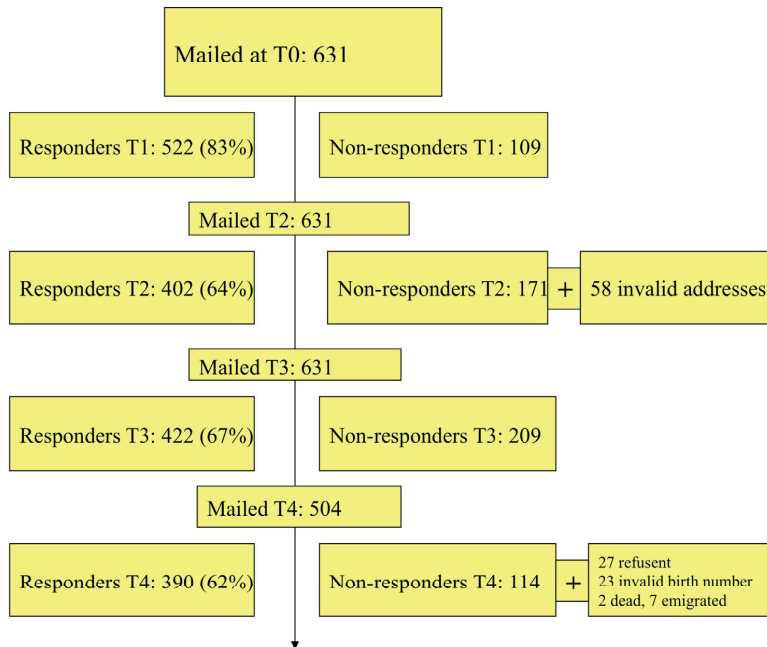
Figure 3 The medical student cohort



3.2.2 The young physician cohort

Participants in the young physician cohort were students graduating from all four medical schools in Norway in 1993 and 1994 (N = 631). Of these final-term students (T0), 522 responded to a postal questionnaire (overall response rate = 83%). The mean age of this group was 28 ± 2.8 years, and 57% were female. One year later, at the end of the first postgraduate hospital year (internship / T1), this cohort again received a postal questionnaire; 371 responded (71% of the final-term sample, 58% of the original total student population). The mean age of the group at T1 was 29 ± 2.8 years, and 56% were female. The T1 wave offered challenges with tracking the addresses of the participants (See (Tyssen et al., 2000)). In their 4th postgraduate year, at T2, 422 responded of the original cohort, giving a response rate of 67%. 56% were female, mean age was 31 ± 2.8 years. At their 9th postgraduate year, (T3) 390 responded, 62% of the original cohort. 58% were female and mean age was 37 ± 2.7 years.

Figure 4 The young physician cohort



3.2.3 The general working population cohort

A stratified random sample of the general working population of Norway (N = 1001, 50% women, 50% men, mean age 46 ± 10 years), was used for comparative analyses, thus assessing the relative level of emotional exhaustion in Article IV. 582 (58.2 %) responded to the burnout questionnaire, of which 15% were academics (44 % women, 56% men, age $42, \pm 10$ years).

3.3 Dependent variables

3.3.1 Perceived job stress

Perceived job stress was measured in the 1st, 4th, and 9th postgraduate year with a modified version of the Cooper Job Stress Questionnaire (Cooper, 32 items self-report, modified by Tyssen) (Cooper et al., 1989; Tyssen et al., 2000). The questionnaire was originally used to study job stress and mental health in British general practitioners. Eleven items were deleted and replaced with 12 items to adapt the questionnaire to Norwegian house officers. Items deleted covered

administration of practice and home visits, and thus were not relevant to our study of a representative sample including all specialties. The questionnaire presented the physician with a series of situations and asked him/her to rate the degree of experienced stress on a scale from 1 to 5, higher values indicating more stress. A factor analysis with varimax rotation was conducted on the T1 data. Based on items that loaded more than 0.4 on one factor and at least 0.2 less on the other factors, four indices were constructed: (1) Emotional pressure in patient work, e.g. 'I am stressed by dealing with suffering patients' (Cronbach's α was 0.83), (2) Time pressure, e.g. 'I am stressed by interruptions and fuzz' (Cronbach's α was 0.75), (3) Fear of complaints and criticism, e.g. 'I am stressed by the possibility of complaints from patients' (Cronbach's α was 0.74), (4) Work-home interference, consisting of three items: 'work interferes with family life', 'problems balancing work and private life', 'work interferes with social life'. Cronbach's α was 0.81. The reliability of these factors may be considered good, with Cronbach's α ranging from 0.74 to 0.83. The work-home interference factor of the Cooper job stress measure was used as the dependent variable in Article III and an independent variable in Article IV. The items are detailed in Appendix 1 of Paper III. The items formulation in the job stress inventory poses a methodological issue. The phrasing "To what degree do the following situations make you stressed?" contains both the stressor aspect and the resulting stress aspect. A causal inference is included in the questions itself and may to a certain degree preclude the strain stress model, where the predictors should be distinct stressors and the dependent variable should be the resulting stress perception in the individual. This job stress questionnaire has previously been validated in prediction of mental distress and job dissatisfaction (Cooper et al., 1989; Sutherland & Cooper, 1992) and mental health problems among junior house officers (Tyssen et al., 2000).

3.3.2 Mental distress

Mental distress in the previous two weeks was measured using the self-report instrument, SCL-5, a five-item version of the Symptom Check List-25 that taps anxiety and depressive symptoms. The SCL-5 is based on a factor analysis by Tambs and Moum (Tambs & Moum, 1993). The five items on distress in the last 14 days comprise three anxiety items ('Feeling fearful', 'Nervousness or shaking inside', 'Worrying too much about things') and two depression items ('Feeling

hopeless about the future', 'Feeling blue'). Each item is rated on a five-point scale, from 0, 'Not at all', to 4, 'Very much'. Cronbach's $\alpha = 0.86$, a good reliability. The instrument has demonstrated satisfactory psychometric properties (Strand et al., 2003) and has been validated in other studies. Previously, higher SCL-5 scores have been preceded by negative life events (Størksen et al., 2005) and it has also been linked to use of alcohol to cope with tension (Tyssen et al., 1998).

3.3.3 Perceived medical school stress

Perceived medical school stress was measured by a eight- item version of Vitaliano's instrument, with one modified item as described previously by Bramness et al. (Vitaliano et al., 1984; Bramness et al., 1991). The instrument, developed through interviews with students, consists originally of 13 items. In our study, only eight items were used, due to missing items in the questionnaire, covering academic pressures such as 'I am concerned that I will be unable to master the entire pool of medical knowledge' and social and personal pressures such as 'Medical school fosters a sense of anonymity and feelings of isolation among students'. The correlation between the eight- and 13-item total scores at mid-curriculum was 0.93 (Pearson's r). The items were scored on a five-point scale from 1–strongly disagree, to 5–strongly agree. High sumscores of this instrument indicated high stress. The Vitaliano instrument has been validated in studies among students predicting anxiety and depression both in the US and in Norway (Bramness et al., 1991; Vitaliano et al., 1984), and our research group has previously described its predictive validity in terms of mental health problems among medical students (Midtgaard et al., 2008) and postgraduates (Tyssen et al., 2001b). The reliability of the instrument in our sample was $\alpha = 0.78$, which may be considered acceptable.

3.3.4 Burnout

Burnout was measured by the emotional exhaustion dimension of the Maslach Burnout inventory - Health Services Survey. The items are listed in the appendix in Article IV. The scale of the six items used were modified from the original frequency scale, criticized for having categories that are not mutually exclusive (Barnett et al., 1999), to cover the emotional exhaustion in the last 14 days, on a five-point scale ranging from 1 (totally disagree) to 5 (totally agree). Chronbach's α

= 0.88 reflects a good reliability. This version has also been validated in other studies among Norwegian physicians, ambulance personnel and seven other working professions (Falkum, 1996; Langballe et al., 2006; Sterud et al., 2008; Rø et al., 2008). Three items were omitted from the instrument. Two items specific to human services work ('Working with people all day is really a strain for me' and 'Working with people directly puts too much stress on me') were omitted to make possible a comparison with the general working population. A third item, 'I feel I'm working too hard on my job', was omitted due to conceptual overlap with two of the explanatory variables (work-home interference stress; workload). In this way the constructs are clean, with good discriminant validity between the dependant and explanatory variables.

3.3.5 Help-seeking

Help-seeking was assessed in the Young Physician Cohort in the last year of medical school, and in the 1st and 4th postgraduate years. The respondents were asked: 'If you had mental health problems during the last year, did you seek/receive help for them?' Response alternatives were: 1, have had no mental health problems of importance; 2, have not sought help, although I have needed it; 3, yes, have consulted a general practitioner; 4, yes, have consulted a psychologist/psychiatrist; 5, yes, have been admitted to a hospital psychiatric department. The prevalence of need for treatment was determined by combining responses 2–5, and the number seeking professional help comprised the response alternatives 3–5. In medical school (T1), the students were asked: 'Have you ever had mental health problems?' and 'If yes, have you sought/received help for this?' with the same five response alternatives as above. Thus, lifetime prevalence was captured in the undergraduate assessment, while the data from the postgraduate time points in the 1st and 4th postgraduate year referred to prevalence over the preceding year. A weakness of this variable is the single-item character. A limitation of the instrument is that those who not realise their own need for help hardly report this. This may give an underestimation of treatment needs.

Table 1 Dependent variables, with points of measurement

	3 rd year medical school	T0 6 th year medical school	T1 1 st post- graduate year	T2 4 th post- graduate year	T3 9 th post- graduate year	General working population
<i>Paper I</i>						
Work stress (scale 1 – 5)			2.5 (0.5)			
Mental distress (scale 1 – 5)			1.6 (0.7)			
<i>Paper II (student cohort)</i>						
Perceived medical school stress Mean (SD),	2.5 (0.6)	2.5 (0.6)				
<i>Paper III</i>						
Emotional pressure, Mean (SD), (Scale 1 – 5)			2.4 (0.6)	2.1 (0.6)	2.0 (0.6)	
Time pressure Mean (SD), (Scale 1 – 5)			2.6 (0.7)	2.5 (0.7)	2.4 (0.7)	
Fear of complaints Mean (SD), (Scale 1 – 5)			2.5 (0.7)	2.2 (0.7)	2.1 (0.7)	
Work - home interference Mean (SD), (Scale 1 – 5)			2.4 (1.0)	2.5 (1.0)	2.6 (1.0)	
<i>Paper IV</i>						
Emotional exhaustion Mean (SD) (Scale 1 – 5)			2.2 (0.7)		2.3 (0.8)	2.1 (0.7)
<i>Paper V</i>						
Mental health problems in need of treatment			11%	17%		
Help-seeking for mental health problems			50%	41%		

3.4 Independent variables

3.4.1 Demographic characteristics

Age was measured as a continuous variable. Gender was coded 1 for women and 2 for men. Number of children was coded on a four-point scale: no children; 1 child; 2 children; 3 or more children.

3.4.2 Personality traits

Personality traits were measured at T0 and T1 in the Young Physician Cohort, in randomly selected halves of the sample, as personality is presumably stable over time, by using the 36-item version of Torgersen's Basic Character Inventory (Torgersen, 1980a; Tyssen et al., 2000). No differences were found between the T0 and T1 responses (t tests). Lazare, Klermann, and Armor originally constructed this instrument in 1966 to cover psychoanalytically based personality features. The instrument was modified by Torgersen in 1980 and validated in Norwegian populations (Lazare et al., 1966; Torgersen, 1980a). This instrument was chosen partly because it was already used in a research program among Norwegian physicians conducted by the Norwegian Medical Association and partly because it is a relatively non-extensive instrument, enabling us to keep down the size of our questionnaire. This instrument measures the Giant Three personality dimensions of neuroticism (N) (also called vulnerability), extraversion (E) (intensity), and conscientiousness (C) (control, constraints), as well as a fourth dimension, reality weakness (R), measuring non-psychotic twisted perceptions of reality, self and others. Each dimension is measured by dichotomous response (agree/do not agree) on nine questions, and is scored as a total score with a range from 0 (low) to 9 (high), thus giving a continuous variable. Cronbach's α for the scales in the medical student sample / the physician sample were: neuroticism = 0.68 / 0.82, extraversion = 0.68 / 0.87 and conscientiousness = 0.67 / 0.73. The medical student sample demonstrates lower reliability coefficients than the physician sample: the student sample has acceptable Cronbach's α ranging from 0.67 to 0.68; in the physician sample the reliability is good, ranging from 0.73 to 0.87. The intercorrelations between the traits were low (medical student sample: Pearson's r : N*E = -0.20, N*C = 0.12, E*C = -0.07; physician sample: Pearson's r : N*E = -0.19, N*C = 0.11, E*C = -0.17). Cronbach's α for the reality weakness scale (the

young doctor cohort, Article V) was 0.65. The instrument has been validated and has given meaningful results in earlier clinical and non-clinical studies (Torgersen, 1980b; Torgersen, 1980a; Alnaes & Torgersen, 1990; Ravndal & Vaglum, 1991; Kaldestad, 1994; Perry et al., 2002; Neilands et al., 2008). It has also been used in previous studies on Norwegian medical students and physicians (Aasland et al., 1997; Tyssen et al., 2000; Tyssen et al., 2001b; Tyssen et al., 2005).

3.4.3 The Torgersen personality typology

The types in this typology were constructed from the three scales of neuroticism, extraversion, and conscientiousness obtained from the BCI and in accordance with Torgersen's model (Torgersen, 1995; Vollrath & Torgersen, 2000). Median splits were used (neuroticism: median = 3; extraversion: median = 6; conscientiousness: median = 3) and the participants were assigned to one of eight

Table 2 Torgersen's personality types, student and young doctor cohorts

Types	Composition			Student cohort			Young doctor cohort		
	N	E	C	Female n (%)	Male n (%)	Total n (%)	Female n (%)	Male n (%)	Total n (%)
Spectators	-	-	-	3 (2.1)	9 (9.4)	12 (5.1)	8 (3.1)	15 (7.9)	23 (5.2)
Insecures	+	-	-	13 (9.3)	7 (7.3)	20 (8.5)	29 (11.3)	17 (9.0)	46 (10.3)
Sceptics	-	-	+	10 (7.1)	12 (12.5)	22 (9.3)	11 (4.3)	19 (10.1)	30 (6.7)
Brooders	+	-	+	20 (14.3)	10 (10.4)	30 (12.7)	56 (21.9)	25 (13.2)	81 (18.2)
Hedonists	-	+	-	15 (10.7)	22 (22.9)	37 (15.7)	35 (13.7)	28 (14.8)	63 (14.2)
Impulsives	+	+	-	18 (12.9)	4 (4.2)	22 (9.3)	47 (18.4)	26 (13.8)	73 (16.4)
Entrepreneurs	-	+	+	22 (15.7)	17 (17.7)	39 (16.5)	23 (9.0)	36 (19.0)	59 (13.3)
Complicated	+	+	+	39 (27.9)	15 (15.6)	54 (22.9)	47 (18.4)	23 (12.2)	70 (15.7)
Total				140 (100)	96 (100)	236 (100)	256 (100)	189 (100)	445 (100)

N = neuroticism; E = extraversion; C = conscientiousness; + represents values greater than median, - represents values less than median

distinct personality types with unique combinations of high or low levels of the three dimensions, as shown in Table 1. This typology has demonstrated good predictive validity in studies on stress and coping and health behaviour (Vollrath & Torgersen, 2000; Vollrath & Torgersen, 2002).

3.4.4 Work characteristics

Work hours were measured as a continuous variable.

Work load was measured with three items with scales from 1 (Never) to 5 (Often): ‘I work under an unacceptable pressure’; ‘I have so many tasks that it negatively influences work efficacy’; ‘I have problems with working undisturbed to do specific tasks’. The instrument has a good reliability, with Chronbach’s $\alpha = 0.83$. The items are listed in the appendix in Article IV. The instrument has been validated to be associated with job dissatisfaction and it is negatively correlated to autonomy (Falkum, 1996).

Autonomy at work was measured with an index consisting of six items covering influence on working pace, order and postponement of tasks, and planning and organization of work schedules. This instrument has previously been used in a Norwegian study of job stress among physicians (Falkum, 1996). Two of the items had a three-point scale, one had a four-point scale, and these scales were converted mathematically to five-point scales prior to using them in the regressions. Chronbach’s α was 0.90, a good reliability. The items are listed in the appendix in Article IV.

3.4.5 Support

Spouse support was measured using a rating scale with four items on emotional and instrumental spouse support as well as spouse acceptance of physician’s working schedule (e.g. ‘When the work situation is bad, I find comfort and support in my spouse’; ‘My spouse think I work too much’ (reversed)), using a scale from 1 (Is not at all the case) to 5 (Is absolutely the case). The reliability was acceptable with a Cronbach’s α of 0.66.

Colleague support was measured using a rating scale consisting of two questions: ‘To what degree are you taken care of by your colleagues?’ and ‘To what degree do

you enjoy working with your colleagues?’ using a scale from 1 (Not at all) to 7 (To a very high degree). There was a good internal consistency, Cronbach’s α was 0.84. **Perceived social support** was assessed with one question: ‘In case you fell ill and stayed in bed over a certain period of time, how likely is it that you would get the necessary support from family, friends and neighbors?’ The scores were from 1 (Very likely) to 5 (Completely unlikely). The values were reversed; high scores indicating a high level of perceived support. A weakness of the instrument is it being a single-item measure; however, by face validity it is a meaningful construct.

3.4.6 Perceived level of mental health problems

Perceived mental health problems were assessed with a question: ‘Have you suffered from mental health problems during the last year?’ It was scored on a five-point scale from 0 (Not at all) to 4 (Very much). The measure has a somewhat weak validity as a single-item measure.

3.5 Statistical analyses

In all the papers, statistics were performed with the statistical package SPSS, version 14.

Papers I and II: Linear regressions and analysis of variance were used to predict stress. Continuous variables of neuroticism, extraversion and conscientiousness with two- and three-way interactions were independent variables in the linear regression models, whereas the analysis of variance model used eight personality types based on dichotomization of the same three personality dimensions as independent variables. Finally, the statistical strength of the two approaches was compared.

Paper III: Multilevel linear models with repeated measures were used to test the course of stress related to emotional pressure, time pressure, fear of complaints and work-home interference. Work-home interference stress was tested in a multilevel, multivariate analysis, to examine the course of stress controlled for concurrent explanatory variables measured on all occasions. Interactions between time (T1-T3), and independent concurrent variables that were significant, were entered in the final model. Participants who had answered at least on one occasion were included in the predictor analyses, and those who had answered on at least two occasions were included in the course analysis. This reduces the

dropout rate compared to general linear models, where individuals with one or more missing values are excluded from the analysis.

Paper IV: The level of emotional exhaustion in the sample of physicians was compared with the level in the general working population sample by independent samples t-test. Linear regressions were used to test for predictors of emotional exhaustion. The coefficients were reported as unstandardized β s. The development of emotional exhaustion from T1 to T3 was tested among the physicians with a paired samples t-test.

Paper V: Chi-square (5 % level of significance) was used to test for differences between the categorical variables. Logistic regression analyses were used to predict help-seeking.

Comparison of levels of personality dimensions between samples of the present and other studies was done with the independent samples *t* test from GraphPad Software (GraphPad Software, 2002).

3.6 Methodological issues

3.6.1 Study design

This study has a longitudinal design with measurements at four points of time. This gives the opportunity to explore real prediction in time where variables at an earlier time point can predict outcomes at a later stage. The longitudinal design also makes it possible to follow the development of outcomes over time and explore predictors of such developments or change in such outcome variables.

When using a repeated measures design in a mixed model as in Article III in the present study, the dependency between the variables measured on the same individual at different occasions is taken into account. This has implications for the estimation of the uncertainty of the data, as in the confidence interval, modelled as follows:

$$\text{Var}(X1-X2)= \text{Var}(X1)+\text{Var}(X2) -2\text{Cov}(X1,X2)$$

where the shared variance term, $-2\text{Cov}(X1,X2)$, is negative for all practical purposes. From this follows that the uncertainty in the data is reduced when taking into account the shared variance between the variables measured at repeated occasions in the same individual, thus enhancing the possibility of discovering significant results. Put in another way, this reduces the risk of Type II

errors in the analyses, when compared to using general linear models. Another important strength of the mixed model is a reduction of missings in the analyses, as the correlation matrices in the analyses include all individuals who have responded on a minimum of two repeated measurements. Thus, a greater N gives the multilevel model more power, an aspect that reduces the chance of Type II errors.

There are considerable time spans between measurement points in our study and diverse aspects of private life – as well as work life – beyond the focus of our variables and statistical models may affect the outcome and the relationship between predictors and outcome. Some researchers have made an effort to find the optimal time range for finding predictor effects in repeated surveys. One- or two-year time spans have been reported optimal in prediction of mental health (de Lange et al., 2004; Dormann & Zapf, 2002). In this context, papers I and II of this thesis may have a quite optimal time span of one year between predictor and outcome assessment. On the other hand, an underestimation of results should be considered in a study design with longer time spans between measurements, as was the case in Article III on work-home interference and Article IV on burnout. However, sound criticism should be applied in this issue: for instance a post-traumatic stress disorder resulting from early trauma would require quite another time span of observation.

3.6.2 Attrition

Attrition of respondents is an important issue in longitudinal studies, since selective attrition may bias the results and excessive attrition may weaken the results. Therefore, exploration of possible differences in age, gender and independent variables between responders and non-responders is pertinent. Since the present study is a self-report study, where the responders are anonymous to the researchers, it unfortunately cannot explore differences between responders and non-responders (n = 109) at baseline.

In order to study selection bias in **the medical student cohort**, distributions of age and sex in the baseline sample (n = 374) were compared with those who responded on all occasions (n = 236), but no statistically significant differences were found (mean age = 22.1 ± 3.0 years, 53% female). They were also compared with a subsample (n = 156) of the original cohort (n = 421), who started medical

school at the University of Oslo (one of the four universities in the study) in 1993. The cohort of Oslo students who responded on all occasions ($n = 93$) was not significantly different from the original subsample with respect to either age (22.2 versus 22.7 years) or sex (58% versus 53% female).

In the **physician cohort** there was a gender bias at T0, where 22% of the men and 13% of the women did not respond ($OR = 1.8, p < 0.01 (1.2 - 2.7)$). The mailing in the 1st postgraduate year was complicated by difficulties in finding correct work site addresses, since all the students had by then moved to their respective internship hospitals. This accounted for 9% ($n = 58$) of the loss of follow-up on this occasion. No differences were found between the responders and non-responders in the 1st, the 4th and the 9th postgraduate year concerning independent variables, except for a lower level of the personality trait of intensity among the non-responders in the fourth postgraduate year (5.0 ($SD = 2.4$) versus 5.7, $SD = 2.5$; $t = -2.3, P = 0.02$).

This present study has targeted stress among physicians. Levels, course and predictors of stress, burnout and help-seeking have been put under scrutiny. Perceived stress may be related to response behaviour. Perceived overload may contribute to both passive non-response (non-response due to perceived lack of time) and active non-response (due to resentment toward the organization for high workload). The latter might be related to less organizational support. (Barr et al., 2008; Barr et al., 2008). This might bias the results toward a lower level of reported stress in the sample. Active non-responders have been demonstrated to be less conscientious than responders (Rogelberg et al., 2003; Podsakoff et al., 2000). Given this presumption, the results might be biased toward lower reported conscientiousness levels.

Survival bias is poignant to consider in burnout research. Those who burn out may tend to quit the job, thus leaving behind those with lower burnout levels. This has also been termed the 'healthy worker effect', and may affect the results by weakening the correlations between predictors and burnout, thus creating Type II errors. However, when comparing non-responder with responders at T3, the non-responders did not report significantly higher exhaustion at T1 than the responders in the subsample of 100 physicians that completed the exhaustion measure at T1. This indicates that a healthy worker effect is not probable.

3.6.3 Limitations

Because the samples consisted of physicians and medical students the results cannot be generalized to the general population on the basis of the articles dealing with specific physician working conditions or medical student issues. Results from the relation between personality and stress however (Article I), without bringing in variables specific to physician work, may be generalizable to the general population.

The sample size may be considered small for personality types in stress prediction in Article I and II, taking into account that as many as eight groups were compared in our typology, thus making Type II errors more likely.

A weakness of the study is that it is a self-report study and not based on observed data. As neuroticism is known to predispose to more negative reporting and the physician cohort scored higher on neuroticism than the general working population, this might be associated with a reporting bias. This may especially be the case when stress, burnout and mental health problems are outcome targets. However, all analyses are controlled for neuroticism and in this way the results are more valid and not merely a result of a tendency to report negatively.

3.7 Ethics

To ensure the confidentiality of the respondents, Statistics Norway matched the data file identities with the identities of the participants. In this way, only anonymous data were presented to the researchers. The study was conducted according to the guidelines of the Regional Committee for Medical Research Ethics in Norway and with the approval of the Norwegian Data Inspectorate.

4 Results and summary of the papers

4.1 Paper I:

Exploring the interplay between personality dimensions: A comparison of the typological and the dimensional approach in stress research

Personality and Individual Differences 2007;42:1255–66, Røvik JO, Tyssen R, Gude T, Moum T, Ekeberg Ø, Vaglum P.

Background: There is a lack of knowledge on how the interplay between neuroticism, extraversion, and conscientiousness determines stress.

Methods: Both the typological and the dimensional approaches were applied to a sample of 371 Norwegian physicians in their internship year, to explain stress.

Results: Neuroticism was significantly associated with mental distress ($F = 60.85$, $p = 0.001$) and job stress ($F = 65.7$, $p = 0.001$), the latter in the form of a curvilinear relationship. Curvilinearity in the relationship between neuroticism and the stress measure seemed to reduce the loss of predictive power resulting from dichotomization of the personality dimensions. Among personality types with low neuroticism and high extraversion, those who are *low on conscientiousness (hedonists)*, report lower job stress and mental distress, whereas those who are high on conscientiousness (entrepreneurs) report lower mental distress only. Among personality types with high neuroticism and low extraversion, only those who are *high on conscientiousness reported higher stress* than the others pooled (brooders). Among personality types with high neuroticism and high extraversion, only the *high conscientious type reported higher stress* than the others (complicated).

Conclusion: Neuroticism was most consistently associated with stress. Conscientiousness had a moderating role on stress, as those with high conscientiousness reported higher stress than those with low conscientiousness, for given constellations of levels of neuroticism and extraversion.

4.2 Paper II:

Personality types predict medical school stress: a nationwide longitudinal study

Medical Education 2007;41:781-7, Tyssen R, Dolatowski FC, Røvik JO, Thorkildsen RF, Ekeberg Ø, Hem E, Gude T, Grønvold NT, Vaglum P.

Background: This study examines whether both personality types and traits predict stress during medical school training.

Methods: Survey of Norwegian medical students (N = 421) one month after medical school started (T1), in the middle of the third undergraduate year (T2) and at the end of the sixth undergraduate year (T3). Two hundred and thirty-six medical students (56%) responded at all time points. They were categorized according to the personality typology of Torgersen by their combination of high and low scores on the “Giant Three” personality traits of extraversion, neuroticism and conscientiousness. Effects of both personality types (spectator, insecure, sceptic, brooder, hedonist, impulsive, entrepreneur and complicated) and traits on perceived medical school stress (T1+T2) were studied.

Results: There was a higher level of medical school stress among the female students. The traits neuroticism ($P = 0.002$) and conscientiousness ($P = 0.03$) were independent predictors of medical school stress, while female gender was absorbed by neuroticism in the multivariate model.

When controlled for age and gender, “brooders” (low extraversion, high neuroticism, high conscientiousness) were at risk of experiencing more stress ($P = 0.02$), whereas “hedonists” (high extraversion, low neuroticism, low conscientiousness) were more protected against stress ($P = 0.001$).

Conclusions: This is the first study to show that a specific combination of personality traits can predict medical school stress; in particular, the combination of high neuroticism and high conscientiousness is considered high risk.

4.3 Paper III:

Job Stress in Young Physicians, with Emphasis on the Work–Home Interface. A Nine-Year Nationwide and Longitudinal Study of Course and Predictors

Industrial Health 2007; 45: 661-70, Røvik JO, Tyssen R, Hem E, Gude T, Ekeberg Ø, Moum T, Vaglum P.

Background: Although physicians are known to experience more stress than other workers, we lack knowledge on the course of stress from a longitudinal perspective. This study explored the course and contributors to different dimensions of early career job-stress among physicians by means of a nationwide mail survey, with a particular emphasis on stress relating to the work-home interference.

Method: All physicians graduating from the four Norwegian universities in 1993 / 94 (N = 631) responded during their last year of medical school (N = 522), during their internship (N = 402), in their 4th postgraduate year (N = 422) and their 9th postgraduate year (N = 390). The mean observation time was 9.2 years (SD = 0.5). The main outcomes were job stress dimensions derived from an established job stress questionnaire (Cooper/Tyssen), with emphasis placed on dimension of the work-home interference.

Results: Stress related to the work-home interference *increased* during the observation period for both genders (repeated measures: $\beta = 0.07$, $p = 0.035$), whereas treatment-specific stress related to emotional pressure, time pressure, and fear of complaints and criticism, *decreased*. The increase in stress related to the work-home interference was associated with a lack of adaptive reduction in work hours and an increased number of children. Neuroticism, conscientiousness and lack of support from one's partner and colleagues, appeared to be predictive of this stress. Conscientiousness demonstrated a curvilinear J-shaped relationship with the work-home interference stress, with the lowest stress levels in the mid-range of the conscientiousness scale.

Conclusions: Work-home interference stress is predicted by neuroticism, conscientiousness, lack of support and lack of reduction in working hours.

4.4 Paper IV:

Emotional exhaustion among early career physicians: A nationwide nine-year longitudinal and comparison study of levels and predictors.

Submitted. Røvik JO, Tyssen R, Hem E, Gude T, Falkum, E, Ekeberg Ø, Vaglum P.

Background: Burnout among physicians may interfere with both their patient care and personal career, but few have compared their levels of emotional exhaustion with normative samples or studied possible individual risk factors of burnout with a longitudinal design.

Methods: This study explored the level of emotional exhaustion in physicians compared to that in the general working population. Possible causal relations between personality, earlier stress and social support, and emotional exhaustion were studied in a longitudinal design among the physicians. The participants were physicians graduating from all four Norwegian universities in 1993/94 (N = 631), responding to a postal questionnaire four times during 9.2 years (SD = 0.5). Response rates ranged from 82% to 62%. Levels of emotional exhaustion (modified Maslach Burnout Inventory) in the 9th postgraduate year were compared with the levels in a general working population sample (N = 1001).

Results: Young Norwegian physicians report somewhat higher emotional exhaustion than the general working population (2.3 (SD = 0.8) versus 2.1 (SD = 0.7), $t = 6.3$, $p = 0.001$), but not higher than other academics. Higher levels of emotional exhaustion among these physicians were predicted by neuroticism ($\beta = 0.06$, $p = 0.013$), work-home interference stress ($\beta = 0.12$, $p = 0.002$), and lack of support from colleagues ($\beta = -0.07$, $p = 0.013$). Controlled for T1 exhaustion neuroticism ($\beta = 0.07$, $p = 0.04$) and work-home interference stress ($\beta = 0.11$, $p = 0.03$) remained significant predictors of T3 exhaustion, together with T1 exhaustion ($\beta = 0.35$, $p = 0.02$).

Conclusions: Emotional exhaustion in Norwegian physicians' early career is affected by difficulties in balancing work and home life. Thus, both individual and organizational interventions may be considered in preventing emotional exhaustion. Starting interventions early is important to hinder burnout later on.

4.5 Paper V:

Help-seeking for mental health problems among young physicians: is it the most ill that seeks help?

Soc Psychiatry Psychiatr Epidemiol 2004;39:989-93, Tyssen R, Røvik JO, Vaglum P, Grønvold NT, Ekeberg Ø.

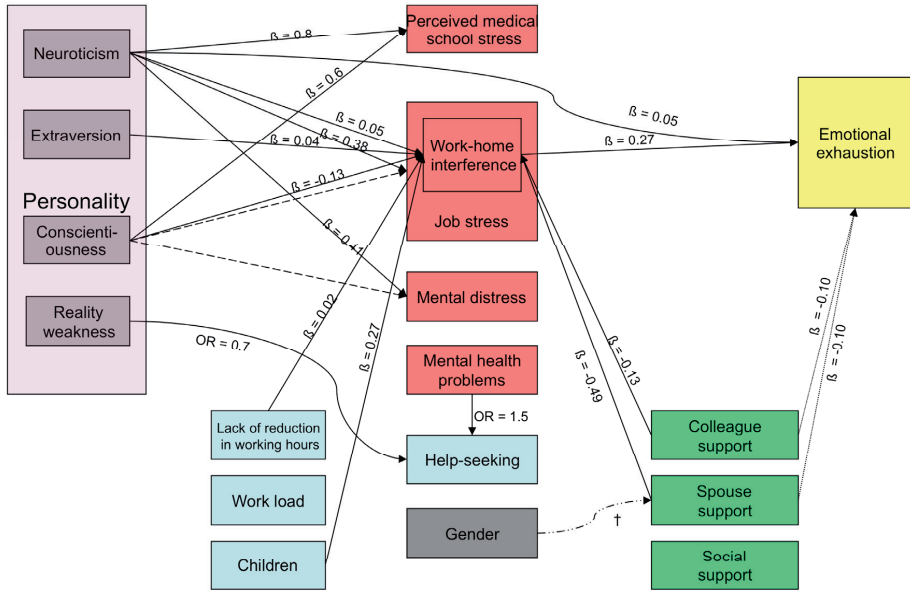
Background: The aims of this study were to assess the prevalence of self-reported mental health problems and help-seeking among young physicians, and identify predictors of seeking help.

Methods: A prospective cohort sample of Norwegian medical students (N=631) were assessed in their final semester (T1), and in the first (T2) and fourth (T3) postgraduate year. The average observation period was 3.6 years.

Results: The prevalence of mental health problems that needed treatment over the preceding year was observed to have increased from 11% at T2 to 17% at T3. There was no increase in help-seeking. Longitudinally, 34% reported ever needing treatment, and 64 % thereof had sought help. Adjusted predictors of help-seeking were perceived level of mental health problems and a reality weakness personality trait.

Conclusion: Those who sought help had higher levels of emotional distress than those who did not. However, higher reality weakness scores predicted lower help-seeking and, therefore, may be a risk factor for avoiding necessary care.

Figure 5 Revised model with the variables of the present study entered



— Multivariately significant. Bivariately significant. - - High-conscientious types have higher stress. †: Women perceive higher spouse support than men

5 General discussion

5.1 Stress

The level of **perceived medical school stress** in our medical student cohort was moderate at 2.6 (SD = 0.6) on a scale from 1 (low) to 5 (high), and did not change from mid-curriculum to the last year of medical school (Fig. 4). However, there was a gender difference in the mid-curriculum, women being more stressed than men, but this difference vanished when reaching the last year of medical school. Few prospective studies among medical students and physicians report on the development of distress, which is a strength of the present study. There are several studies that show a deterioration in mental health over the first four years in medical school (Aktekin et al., 2001; Rosal et al., 1997; Clark & Zeldow, 1988; Lloyd & Gartrell, 1981; Vitaliano et al., 1989; Ball & Bax, 2002; Vitaliano et al., 1989). In contrast, others report unchanged levels of anxiety and depression at the start and the end of the first year (Pyskoty et al., 1990). Since the picture is not consistent, there may be curriculum or cultural factors that are related to stress and distress in medical school.

All four factors of our **job stress** questionnaire were reported on approximately the same moderate level at internship, i.e. around 2.5 (Fig. 4). Emotional pressure, as well as time pressure and fear of complaints, had their highest level in internship and decreased to the 9th postgraduate year. Work-home interference, on the contrary, increased significantly from internship to the 9th postgraduate year. Others have reported high levels of stress from the first postgraduate year (Firth-Cozens, 1987; Hsu & Marshall, 1987; Kapur et al., 1998) and beyond (Baldwin et al., 1997b; Kapur et al., 1998; Pullen et al., 1995). Comparative studies have found higher stress levels among physicians than in other groups. A Norwegian study among 2300 physicians found that physicians more often than other academics experienced a heavy workload, with often hectic and bothersome work (Falkum et al., 1997). To our knowledge, the present study is the first longitudinal and representative study on the levels and course of work-home interference stress among medical postgraduates. There are some longitudinal studies that show that challenges in balancing work and home life may interfere with future speciality

choice (Aasland et al., 2008; Buddeberg-Fischer et al., 2008). A longitudinal study of other population samples have shown work-home interference stress to predict burnout (Demerouti et al., 2004).

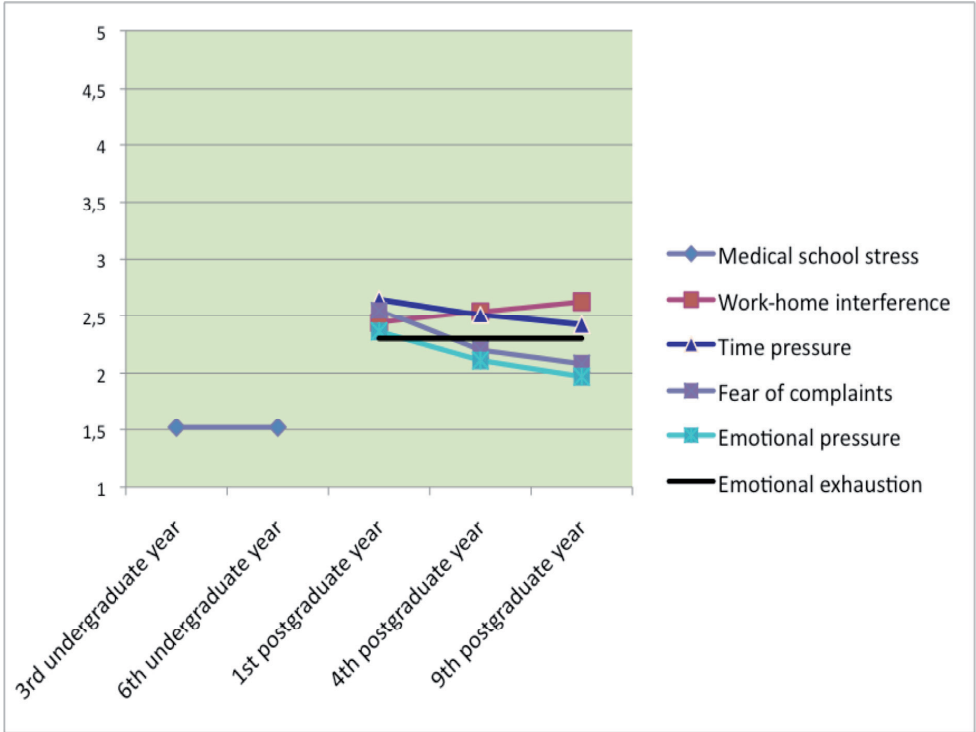
The level of **emotional exhaustion** among the young physicians in the present study was moderate, yet somewhat higher than the general working population, and persisted at this level from the 1st to the 9th postgraduate year. This persisting burnout level coincided with decreases in emotional pressure, time pressure and fear of criticism, and an increase in work-home interference stress. Unfortunately, the present study has not compared the level of emotional distress or job stress to that in other groups. However, a validation of the stress measures lies in the comparison of the burnout level with the general working population. The persisting level of emotional exhaustion in the present study is in accordance with other studies. Gelfand et al. found no significant differences in emotional exhaustion from the first to the fifth year in surgery training (Gelfand et al., 2004). Hillhouse et al. also found no significant burnout change from first to fourth year of surgery and internist training (Hillhouse et al., 2000). No differences in burnout prevalence according to age, gender, level of training or years of employment were found in another study among intensive care residents (Lederer et al., 2008). Although professional confidence and efficacy should increase in this period due to the development of professional skills, no decrease in emotional exhaustion results.

Longitudinal studies on burnout in the early career of physicians point at a persisting burnout level, but knowledge is sparse on the course of burnout later on in the career and should be studied further. If the stressor is perceived as severe and persistent, without resources such as support and control over the situation, the results of the physical and psychological stress may result in burnout in the long run (Spielberger & Vagg, 1999; Vagg & Spielberger, 1998).

The present study found a moderate level of **mental distress** in the first postgraduate year of 1.6 (SD = 0.7) on a scale from 1 (low) to 5 (high). Hsu et al. found higher levels of mental distress and depression in the first postgraduate year

among 1800 young Canadian physicians (Hsu & Marshall, 1987). Another study found a greater frequency of minor psychiatric disorders among 11000 British health professionals (27%) compared to the general population (18%) (Wall et al., 1997). McManus et al. found 20% of UK physicians reached conventional GHQ caseness (McManus et al., 2004). A study among internal medicine residents showed a decrease in emotional distress over three years (Girard et al., 1991), and another study found a prevalence of 29% with depressive symptoms in postgraduate year 1 decreased with time (Reuben, 1985). A diverging picture calls for further longitudinal research with more comprehensive predictor models.

Figure 6 Development of stress dimensions among the physicians



Stress scales, all scales 1 (low) to 5 (high)

Perceived **need for treatment of mental health problems** was reported by 11% in the first postgraduate year and 17% in the fourth postgraduate year. The increase in perceived need for treatment comes during a time when the physicians increase their professional skills and competence and develop a more secure identity as a

physician. This professional development may be reflected in a decrease in emotional pressure, time pressure and fear of complaints – the three patient-work specific factors of job stress in the present study. In light of job stress being a possible predictor of mental health problems (Tyssen et al., 2000), a decrease in mental health problems might be expected when there is a decrease in important work stressors. However, stress outside of work may also contribute to mental health treatment needs, such as negative life events, and other life stress in general. These factors, in addition to work-related factors, may therefore be decisive.

Burnout levels are at a steady, somewhat elevated level compared to the general working population in the same period. Burnout may be seen as the end point when adaptation breaks down after prolonged imbalance between strains and resources. Thus, the prolonged elevated levels of burnout in this group may reflect a prolonged imbalance between demands and resources, although which stressors are most prominent changes over time. Increased competence as physician helps relieve stress related to patient work, but over time the stress related to balancing work and family life becomes more prominent, fuelling a maintained burnout level. Consequently, this may be a reason why the young physicians also report an increased need for mental health treatment over the years.

The **longitudinal course** of job stress and mental distress in medical students and physicians is of interest in addition to cross-sectional reports. Differences in stress levels between different studies may be due to cohort differences and not necessarily valid generalizable career-phase differences. The course of distress adds information to which career phases are most burdensome and may help us to optimize points of intervention. In addition, a longitudinal design may identify predictors prior to such stress, which in turn may help point out early intervention strategies.

5.2 Help-seeking

The increase in perceived need for treatment for mental health problems was coupled with no significant augmentation in **help-seeking** in the present study. 34% reported ever being in need of treatment, of whom 64% had sought help.

Lack of help-seeking is in line with prior knowledge about physicians that demonstrate inadequate self-care (Rosvold & Bjertness, 2002; Töyry et al., 2000b; Baldwin et al., 1997a; King et al., 1992). Physicians tend to treat themselves rather than seek professional help as an ordinary patient, partly because of problems with taking on the patient role in a physician-patient relationship (Tyssen, 2001; Thompson et al., 2001). They have a strong drive towards achievement, but tend to isolate under stress (Borenstein, 1985). As expected, higher levels of perceived mental health problems predicted help-seeking among the postgraduates in the present study.

5.3 Personality and stress

A prominent finding was that both neuroticism and conscientiousness predicted stress, both among undergraduates and postgraduate physicians (Table 3).

Neuroticism was a consistent predictor of stress throughout our study, of job stress and mental distress in Article I, perceived medical school stress in Article II, of work-home interference in Article III, and burnout in Article IV. A question about circularity may be raised in this context. The consistency in prediction could partly stem from content similarities between predictor and outcome. However, the different measurements of the present study emerge as different constructs by face validity (Appendices). The contribution of neuroticism to work-home interference is consistent with other cross-sectional studies (Grzywacz & Marks, 2000; Beauregard, 2006). To our knowledge, only two longitudinal studies (McCranie & Brandsma, 1988; McManus et al., 2004) have previously found that neuroticism predicts stress and burnout among medical postgraduates and doctors.

Conscientiousness independently predicted medical school stress, and among the undergraduates there was a linear relation between this trait and stress. The most diligent and hardworking students feel the burden, whereas those inhabiting low levels of this trait felt more relieved. Conscientiousness also contributed to the level of work-home interference stress, in the mixed model by a squared contribution. Substantially this was seen as a regression line where both high and low levels of conscientiousness were associated with more stress, whereas those individuals with middle values of conscientiousness scored lower on work-home interference stress. From this we can deduce that conscientiousness is optimal with

respect to this stress when an individual scores in the middle of the scale. Too much or too little conscientiousness, on the other hand, are both associated with more stress. Substantially distinct stress-evoking mechanism may play a part in the higher and lower part of the conscientiousness scale. The high-conscientious may become stressed due to internal demands toward themselves, whereas the low-conscientious may become stressed due to external demands and reactions to their lack of responsibility and trustworthiness. The contribution of (high) conscientiousness to physician distress was already pointed out by Gabbard in 1985 (Gabbard, 1985), but merely on the basis of clinical observations rather than on epidemiological data. Gabbard et al. further describe the typical personality of the physician as having an exaggerated sense of responsibility, unrelenting perfectionism and chronic self-doubt (Gabbard & Menninger, 1988). A study among 67 family practice residents found no correlation between the obsessive-compulsive personality trait (analogue to conscientiousness) and emotional exhaustion (Lemkau et al., 1988). No significant multivariate correlations were found (but significant bivariate correlations) between conscientiousness and stress and burnout in young British physicians (McManus et al., 2004). Another study in a diverse Dutch working population, including health care workers, found that only in workers with high conscientiousness do positive perceptions of the job lead to better performance (Demerouti, 2006). In a study among US family practice residents, conscientiousness was not correlated to emotional exhaustion, but little variance in conscientiousness could well have explained the lack of correlation among these highly conscientious physicians (Lemkau et al., 1988).

Extraversion emerged as a predictor of work-home interference stress in the final model, controlled for support from colleagues and spouse. However, this effect was relatively modest, and a previous study in this cohort found that this trait predicted perceived mental health problems (Tyssen et al., 2001b). One may speculate whether young doctors high in this trait more readily report experienced problems in surveys like this. Others have found extraversion to protect against stress (Grzywacz & Marks, 2000; Beauregard, 2006; Costa et al., 1996) and, in general, this trait is linked to lower levels of stress and more subjective well-being.

Reality weakness was an independent predictor of lack of help-seeking in this study. This finding is psychologically understandable, as people with high reality

weakness perceive others as more hostile and are more insecure about their own identity. In addition, persons with high levels of reality weakness might deny their problems to a higher degree than others, thus accentuating the lack of reporting needs.

Help-seeking in a US community sample was associated with neuroticism and inversely related to conscientiousness and extraversion (Goodwin et al., 2002). Reality weakness has proven to be an important predictor of pathology among Norwegian medical students and physicians; such as subjective health complaints (Aasland et al., 1997), aggravation in suicidal ideation (Hem et al., 2004) and mental health treatment needs among medical students (Midtgaard et al., 2008). In the present study, a decline in help-seeking emerges parallel to an increase in mental health problems in need of treatment, which is in accordance with other studies that show inappropriate health care among physicians (Pullen et al., 1995; Rosvold & Bjertness, 2002; Töyry et al., 2000b). Reluctance to seek help might result when mental health problems are regarded as a form of weakness and a potential hindrance to a successful career (Chew-Graham et al., 2003).

Table 3 Personality dimensions, stress and help-seeking, present study

	Job stress internship	Mental distress internship	Medical school stress	Work- home interferen ce	Burnout 9th post- graduate year	Help- seeking
Neuroticism	0.38***	0.41***	0.28***	0.17**	0.25***	
Extraversion	-0.04	-0.10				
Conscientiousness	0.05	0.12*	0.08	-0.02		
Reality weakness Odds ratio (95% CI)						0.7* (0.5-0.97)

*: p < 0.05; **: p < 0.01; ***: p < 0.001. Pearsons correlations, uncontrolled where not otherwise specified

The exploration of the personality impact on stress may benefit from a more comprehensive and integrated approach, taking into account **the interplay between personality dimensions**. As pointed out by Vollrath and Torgersen, we have little knowledge of the effect of combinations of the personality traits of neuroticism, extraversion, and conscientiousness (Vollrath & Torgersen, 2000). The present study used a personality typology in both the medical student cohort (Article II) and the young physician cohort (Article I). When considering the role of the Giant Three dimensions in stress and how they interact we may adopt two different methods of analysis, either using dimensions and their interactions regressed into the stress measures, or creating a typology from combinations of high and low scores of the dimensions. These two approaches were compared in Article I. The degree of loss of predictive power was compared in the two models. Both models demonstrated loss of predictive power, the dimensional model due to polynomial regression issues and the typological model due to dichotomisation of the dimensions when creating the typology. The dimensions explain more of the total explained variance in stress/distress, in particular when there is a linear relation between personality and stress. However, when there is a curvilinear relationship between a personality dimensions and the stress measure there is a boost in predictive power that outweighs much of the dichotomisation-based loss of predictive power. The typological approach is superior to the dimensional in that it gives additional information on the interplay between dimensions and the moderating role of conscientiousness that the dimensional approach fails to do. Substantially, personality types with high conscientiousness are more stressed in comparison to low conscientiousness types, given the same pattern of high and low neuroticism and extraversion. Among personality types with high neuroticism and low extraversion, only the brooder types, with high conscientiousness, reported higher stress than the others pooled. Among personality types with high neuroticism and high extraversion, only the complicated types, with high conscientiousness, reported higher stress than the others. A very important advantage of the typology approach is that it describes recognizable individual characters that may be of clinical importance and validity.

The Torgersen personality typology has been used in a Norwegian police sample (Lau et al., 2006) and a Swiss student sample (Vollrath & Torgersen, 2000), in

addition to the present study, thus validating the typology across samples in relation to stress (Table 4). In these studies, high conscientiousness had a stress-aggravating pattern in the interplay with neuroticism and extraversion, which is in accordance with the findings in the present study. For individuals with high neuroticism, both the extraverted and the introverted types, high conscientiousness aggravated the perceived stress. On the other hand, for extraverted individuals low on neuroticism, low conscientiousness seemed to attenuate perceived stress. The personality types are constructed using median splits of the personality dimensions.

Table 4 Levels of BCI personality traits in different samples.

	Neuroticism (scale 0 – 9)	Extraversion (scale 0 – 9)	Conscientiousness (scale 0 – 9)
	Mean (SD)	Mean (SD)	Mean (SD)
Medical students <i>a</i>	3.7 (2.2) <i>m</i>	5.2 (2.2)	3.2 (2.1) <i>q</i>
Physicians <i>b</i>	3.5 (2.3) <i>n</i>	5.6 (2.5) <i>p</i>	3.1 (2.0) <i>r</i>
General working population <i>c</i>	3.0 (2.3)	--	--
Ambulance personnel <i>d</i>	2.7 (2.2)	5.6 (2.3)	3.7 (2.1)
Police <i>e</i>	2.5 (2.1)	5.3 (2.4)	4.3 (2.1)

a (Tyssen et al., 2007); *b* (Røvik et al., 2007b); *c* (Røvik et al., 2009); *d* (Sterud et al., 2008); *e* (Lau et al., 2006)

Independent samples *t* – tests:

m: significantly higher neuroticism than the General working population ($t = 4.6, p < 0.001$), the Ambulance personnel ($t = 7.7, p < 0.001$), and the Police ($t = 10.4, p < 0.001$);

n: significantly higher neuroticism than the General working population ($t = 3.3, p = 0.001$), the Ambulance personnel ($t = 6.2, p < 0.001$), and the Police ($t = 8.9, p < 0.001$);

p: significantly higher extraversion than the Medical students ($t = 2.5, p = 0.013$), and the Police ($t = 2.3, p = 0.019$);

q: significantly lower conscientiousness than the Ambulance personnel ($t = 4.0, p < 0.001$), and the Police ($t = 9.6, p < 0.001$);

r: significantly lower conscientiousness than the Ambulance personnel ($t = 5.0, p < 0.001$), and the Police ($t = 10.9, p < 0.001$).

To compare between samples calls for cautiousness as the median values differ between samples. The samples previously explored with the Torgersen personality types, i.e. ambulance personnel and police, are typical male-dominated working groups. Table 4 indicates lower scores on neuroticism in these groups than among the medical students and physicians in the present study (Table 4). It could be that male-dominated groups under-report on neuroticism, as their culture may dislike the effeminacy of vulnerability. If this is the case, then comparison between groups

may be difficult. The medical students and physicians reported lower conscientiousness than ambulance personnel and police. The medical students and physicians need a certain degree of conscientiousness and orderliness to master the body of knowledge in medicine. Compared to a policeman (and ambulance personnel), the job tasks of a physician in general do not require the same degree of conscientiousness (or control). Thus, certain personality types or styles may also be attracted to careers that fit their personality.

Table 5 Stress in the Torgersen's personality types, present and earlier studies

				Job stress (a) (scale 1-5)	Mental distress (a) (scale 1-5)	Medical school stress (b) (scale 1-5)	Job pressure severity (c) (scale 0-9)	Time pressure (d) (scale 1-4)
	N	E	C	Mean (SD)	Mean (SD)	Sumscore mean (SD)	Sumscore mean (SE)	Mean (SD)
Hedonist	-	+	-	2.16 ^b (0.4)	1.54 ^b (1.7)	35.7 ^b (7.7)	4.6 ^b (0.04)	1.7 ^b (0.6)
Entrepreneur	-	+	+	2.26 (0.4)	1.76 ^b (2.1)	39.1 (9.4)	4.5 ^b (0.05)	1.9 (0.7)
Spectator	-	-	-	2.28 (0.5)	2.05 (2.0)	41.3 (7.4)	4.6 (0.06)	1.8 ^a (0.5)
Sceptic	-	-	+	2.38 (0.5)	2.00 (2.3)	38.8 (8.2)	4.7 (0.06)	1.9 (0.6)
Insecure	+	-	-	2.57 (0.5)	3.58 (2.7)	40.2 (7.2)	5.0 (0.06)	2.0 (0.7)
Brooder	+	-	+	2.63 ^a (0.5)	4.86 ^a (4.3)	43.5 ^a (8.0)	5.1 ^a (0.05)	2.1 ^a (0.7)
Impulsive	+	+	-	2.66 ^a (0.5)	3.38 (3.4)	40.5 (8.3)	4.7 (0.06)	2.1 (0.8)
Complicated	+	+	+	2.74 ^a (0.5)	4.50 ^a (4.2)	42.2 (7.0)	5.0 ^a (0.06)	2.2 ^a (0.8)

^a Significantly higher stress scores than the others pooled; ^b Significantly lower stress scores than the others pooled; N = neuroticism, E = extraversion, C = conscientiousness; + represents values greater than median, - represents values less than median

(a) (Rovik et al., 2007a), (b) (Tyssen et al., 2007), (c) (Lau et al., 2006), (d) (Vollrath & Torgersen, 2000)

Personality is important when considering physicians' stress, burnout and well-being. Troubled personalities in physicians may disturb how they relate to their patients, with resulting malpractice and failing patient care, but equally important to the medical students and physicians is the way they manage to balance their lives, both in the work and home domains. Personality assessment can be a tool in identifying persons prone to stress that may benefit from support in wellness programs hindering excessive stress. (Hojat et al., 1993; Lievens et al., 2002; Hojat et al., 2004). If medical doctors have higher levels of neuroticism this may be one

reason for their relative high levels of depressive symptoms in the long run (Hsu & Marshall, 1987; Tyssen & Vaglum, 2002) and eventually higher risk of suicide (Schernhammer & Colditz, 2004; Hem et al., 2004).

5.4 Other predictors of stress

Age and gender

Higher **age** was a predictor of emotional exhaustion that appeared only in the fully adjusted model in the present study, and it seems that it was suppressed by the number of children. It seems reasonable that high workload at home influences the process of burnout, but this finding should be replicated and studied in more detail. Previous research has shown divergent findings on the effect of age on burnout. Younger age has been associated with emotional exhaustion among anaesthesia residents (Nyssen et al., 2003). However, Shirom found higher age to be associated with burnout (Shirom, 2005).

Being a **woman** predicted perceived medical school stress among the medical students in the present study. This is in accordance with other studies among medical undergraduates (Dahlin et al., 2005; Dyrbye et al., 2006). But our study shows that the gender effect on stress among medical students is mediated by neuroticism personality trait. Interestingly, there was no gender difference in work-home interference stress among the postgraduates. But when we controlled for support from spouse and colleagues in the adjusted predictor model, being a woman appeared as a predictor of work-home interference stress. Thus, the fact that the women physicians extract more support from their spouses and colleagues than men seems to ameliorate their work-home stress.

Work-related factors

Workload in terms of **work hours** had no impact on burnout. This may be due to the rather regulated working hours among Norwegian doctors. During internship they reported working 49.5 hours a week. This is much lower than in the US and England. The 2003 down regulation of work hours among US residents to 80 hours a week has been found to reduce burnout (Gopal et al., 2005; Goitein et al., 2005). In the same line, a large British study found a correlation between high

workload (5 years past and present) and emotional exhaustion (McManus et al., 2004).

In the present study, lack of reduction in working hours seemed to contribute to experience of work-home interference stress. This seems to be an original finding as there appears to be only one other prospective study of work-home interference stress among physicians and this does not measure the effect of working hours (Innstrand et al., 2008). An additional finding in the present study was that women reduced their work hours to a lower level than men in the 9th postgraduate year: women 42.3 hours/week (SD = 8.2); men 45.6 (SD = 7.4). The consequences of this should be studied further.

Perceived workload is more consistently related to emotional exhaustion among physicians than work hours (Biaggi et al., 2003) (Freeborn, 2001). We did not find any effect of perceived workload in the adjusted predictor model of emotional exhaustion, only a univariate effect. One reason for this may be that we have used a comprehensive predictor model that included other work-related factors such as work hours and in particular work-home interference stress.

Autonomy was a bivariately significant predictor of burnout in the present study, but when controlled for the other predictors the effect was absorbed mainly by workload and to some degree by neuroticism. Others have found that lack of autonomy is associated with burnout (Campbell et al., 2001; McMurray et al., 2000; Biaggi et al., 2003). But these studies do not include comprehensive predictor models.

Work-home interference stress was a strong predictor of emotional exhaustion in the present study. There are other cross-sectional studies that have also linked work-home stress to burnout (Geurts et al., 1999; Sargent et al., 2004; Campbell et al., 2001; Linzer et al., 2001), but our finding is consistent with one other large 2-year prospective study that includes physicians (Innstrand et al., 2008). This study found a reciprocal effect between work-family interference and burnout.

Prospective studies in other populations also point to work-home stress as a risk factor for burnout (Bakker et al., 2008; Demerouti et al., 2004). But few studies have used comprehensive predictor models that include both personality and work-related predictors, as well as support. The findings of self-reported stress are strengthened by inclusion of neuroticism (negative affectivity) in the model (Depue

& Monroe, 1986). This means that balancing work and home life is difficult not only for the most vulnerable of the young physicians, and this underlines the significance of this stress among young interns in general.

Perceived support

Colleague support seems to protect against both work-home interference stress and emotional exhaustion. This applies in particular to emotional exhaustion since this was studied prospectively. Some cross-sectional studies have previously found that support from colleagues was related to less burnout (Sargent et al., 2004; Martini et al., 2004; Biaggi et al., 2003), but this study is the first to show the predictive validity of such support over a 5-year period. Supportive colleagues seem essential to protect against stress and burnout on a hectic day-to-day basis, with call-work and home responsibilities with children.

Spouse support was related to less work-home interference stress in the adjusted repeated measures model, and this effect seems to be especially important for the women. However, spouse support was not predictive of burnout in the adjusted model of our study. Therefore, support from work mates seems to be more important than support from the partner in terms of the burnout process among postgraduates. In general, there are few empirical studies on the impact of spouse support on stress among physicians. Undermining of spouse support in relation to work-home interference may add to demands and consequently to exhaustion (Bakker et al., 2008). However, from a study of Norwegian physicians we know that being married to a physician had a positive impact on the career (Gjerberg, 2003).

6 Conclusions and implications

Stress, emotional exhaustion and help-seeking

- Perceived medical school stress persisted on a moderate level from the third to the sixth undergraduate year.

- Stress related to patient work decreased through the first eight years of the physician career, whereas work-home interference stress increased in the same period.
- Emotional exhaustion persisted on a somewhat elevated level compared to the general working population from the first to the 9th postgraduate year.
- The percentage of physicians that reported a perceived need for treatment of mental health problems increased from 11% to 17% from the 1st to the 4th postgraduate year.
- Help-seeking did not increase parallel to the increase in perceived need for treatment from the 1st to the 4th postgraduate year.

Personality and stress

- Neuroticism was, as expected, a consistent predictor of all the stress measures in the present study
- Conscientiousness predicted perceived medical school stress and work-home interference stress.
- Extraversion predicted independently work-home interference stress when controlled for support from colleagues and spouse.
- Reality weakness predicted lack of help-seeking.
- High conscientiousness had a stress aggravating effect for given constellations of high and low neuroticism and extraversion.

Age, gender

- Higher age predicted emotional exhaustion when number of children was taken into consideration. Being a woman predicted perceived medical school stress, mediated through neuroticism. Being a woman also predicted work-home interference, when the women's higher perceived support was taken into consideration.

Work-related factors

- Work hours did not predict burnout, but lack of reduction in work hours contributed to work-home interference stress. Women worked fewer hours per week than men in the 9th postgraduate year.
- Autonomy had an effect on emotional exhaustion going through workload and to some degree neuroticism.

- Work-home interference stress predicted emotional exhaustion.

Support

- Colleague support protected against work-home interference stress and emotional exhaustion.
- Spouse support protected against work-home interference stress.

Implications

- Since stress in medical school is higher in specific personality types, and high conscientiousness may aggravate stress, preventive efforts such as career counselling and stress management techniques may help those prone to adverse effects.
- Career counselling in early career physicians should take into account the importance of stress prone personality types, with special attention to those with high neuroticism and high conscientiousness.
- The increase in the number of physicians that do not seek help for perceived mental health problems during the first postgraduate years calls for the establishment of a readily available health service for physicians with mental health problems. Also a long-term effort should be made both in medical school and in the postgraduate years to change the doctors' attitudes toward better self care.
- Physicians in their early career may profit from supportive colleague groups in dealing with effectively balancing work and home life, and in the prevention of burnout. The focus should be more on stressors specific to patient work from the first year on, then gradually turning more to the challenge of balancing work and home life as this becomes more prominent as years go by.

Appendices

Appendix A

The Cooper job stress questionnaire was modified from the original version as follows:

Items added:

1. Being in a state of readiness.
2. Emotionally engaged with the patients.
3. Expectations that the physician also should deal with non-medical problems.
4. Interruptions and fuss at work.
5. Fear of making mistakes.
6. Fear of litigation.
7. Taking care of suffering patients.
8. Conflicts with colleagues and other staff.
9. Balancing oneself between work and private life.
10. Demands on having to make decisions about economy during work as a physician.
11. Worry about own finances.
12. Thinking about own possible unemployment.

Items deleted:

1. Fear of assaults during night visits.
2. Visiting in extreme adverse weather conditions.
3. Increased demands by patients and relatives for second opinion from hospital specialists.
4. Finding a locum.
5. Night calls.
6. Interruption of family life by telephone.
7. Emergency calls during surgery hours.
8. Home visits.
9. Practice administration.
10. Dividing time between spouse and patients.
11. Lack of emotional support at home, especially from spouse.

Appendix B

Factor analysis of the modified Cooper job stress questionnaire, rotated matrix solution.

		I	II	III	IV
I.	Emotional pressure				
1.	Dealing with the terminally ill and their relatives	0.76	0.01	0.17	-0.01
2.	Daily contact with dying and chronically ill patients	0.72	0.04	0.14	0.06
3.	Taking care of suffering patients	0.71	0.09	0.17	0.00
4.	Twenty four hour responsibility for patients' lives	0.58	0.36	0.11	0.22
5.	Emotionally engaged with the patients	0.56	0.14	0.32	0.14
6.	Dealing with problem patients	0.56	0.33	0.17	0.01
7.	Fear of making mistakes †	0.53	0.31	0.35	0.17
8.	Conducting surgery	0.53	0.07	0.01	0.06
9.	Being in a state of readiness	0.51	0.31	0.08	0.24
10.	Unrealistically high expectations by others of your role †	0.41	0.35	0.16	0.20
11.	Taking several samples in a short time †	0.35	0.31	0.12	0.11
II.	Time pressure				
1.	Interruptions and fuss at work	0.11	0.66	0.29	0.06
2.	Time pressure	0.08	0.63	0.18	0.08
3.	Admissions	0.28	0.63	0.04	0.06
4.	Medical records and paperwork	0.00	0.60	0.12	0.00
5.	Remaining alert when on call †	0.42	0.58	-0.01	0.08
6.	Working environment	0.11	0.54	-0.07	0.17
7.	Night calls	0.32	0.53	0.04	0.16
III.	Fear of complaints and criticism				
1.	Worrying about patients' complaints	0.20	0.15	0.68	-0.02

2.	No appreciation of your work by patients	0.07	0.11	0.66	-0.04
3.	Adverse publicity by media	-0.02	0.24	0.59	0.02
4.	Dealing with relatives as patients	0.28	-0.26	0.55	0.29
5.	Dealing with friends as patients	0.27	-0.31	0.55	0.32
6.	Fear of litigation †	0.37	0.23	0.49	0.16
7.	Expectations that the physician should deal with non-medical problems	0.15	0.17	0.47	0.11
8.	Conflicts with colleagues or other staff	0.12	0.03	0.43	0.20
IV. Work-home interference					
1.	Demands of your job on family life	0.03	0.20	-0.06	0.80
2.	Balancing oneself between work and private life	0.01	0.26	0.01	0.77
3.	Demands of your job on social life	0.14	0.34	0.10	0.71
4.	Worry about own finances †	0.07	0.03	0.12	0.50
5.	Thinking about possible unemployment †	0.08	-0.09	0.23	0.42
6.	Economy decisions during work as physician †	0.24	-0.02	0.29	0.42

† Excluded items, due to loading < 0.4 or loading differences between factors of less than 0.2, or due to differing face validity (item IV-4)

Reference List

- Stress in Health Professionals* (1987). (Eds:Payne,R.; Firth-Cozens,J.) Chichester: John Wiley & Sons Ltd.
- Aasland, O. G., Oloff, M., Falkum, E., Schweder, T., & Ursin, H. (1997). Health complaints and job stress in Norwegian physicians: the use of an overlapping questionnaire design. *Social Science & Medicine*, *45*, 1615-1629.
- Aasland, O. G., Røvik, J. O., & Wiers-Jenssen, J. (2008). Legers motiver for valg av spesialitet under og etter studiet. *Tidsskr Nor Legeforen*, *2008*, 1833-1837.
- Ahola, K., Hakanen, K., Virtanen, M., Koskinen, S., Vahtera, J., & Lönnqvist, J. (2008). Occupational burnout and medically certified sickness absence:A population-based study of Finnish employees. *Journal of Psychosomatic Research*, *64*, 185-193.
- Aktekin, M., Karaman, T., Senol, Y. Y., Erdem, S., Erengin, H., & Akaydin, M. (2001). Anxiety, depression and stressful life events among medical students: a prospective study in Antalya, Turkey. *Medical Education*, *35*, 12-17.
- Alnaes, R. & Torgersen, S. (1990). Basic character inventory personality traits among patients with major depression, anxiety disorders and mixed conditions. *European Archives of Psychiatry & Neurological Sciences*, *239*, 303-308.
- Baker, D. B. (1985). The study of stress at work. *Annual Review of Public Health*, *6*, 367-381.
- Bakker, A. B., Demerouti, E., & Dollard, M. (2008). How job demands affect partners' experience of exhaustion: integrating work-family conflict and crossover theory. *Journal of Applied Psychology*, *93*, 901-911.

- Baldwin, P. J., Dodd, M., & Wrate, R. M. (1997a). Young doctors' health--II. Health and health behaviour. *Social Science & Medicine*, *45*, 41-44.
- Baldwin, P. J., Dodd, M., & Wrate, R. W. (1997b). Young doctors' health--I. How do working conditions affect attitudes, health and performance? *Social Science & Medicine*, *45*, 35-40.
- Ball, S. & Bax, A. (2002). Self-care in Medical Education: Effectiveness of Health-habits Interventions for First-year Medical Students. *Academic Medicine*, *77*, 911-917.
- Barnett, R. C., Brennan, R. T., & Gareis, K. C. (1999). A closer look at the measurement of burnout. *J Appl Biobehav Res*, *4*, 65-78.
- Barr, C. D., Spitzmuller, C., & Stuebing, K. K. (2008). Too stressed out to participate? Examining the relation between stressors and survey response behavior. *Journal of Occupational Health Psychology*, *13*, 232-243.
- Beauregard, T. A. (2006). Predicting interference between work and home: A comparison of dispositional and situational antecedents. [References]. *Journal of Managerial Psychology*, *21*, 244-264.
- Biaggi, P., Peter, S., & Ulich, E. (2003). Stressors, emotional exhaustion and aversion to patients in residents and chief residents - what can be done? *Swiss Med Wkly*, *133*, 339-346.
- Bond, J., Galinsky, E., & Schwanberg, J. (1998). *The 1997 National Study of the Changing Workforce*. New York: Families and Work Institute.

- Borenstein, D. B. (1985). Should physician training centers offer formal psychiatric assistance to house officers? A report on the major findings of a prototype program. *American Journal of Psychiatry*, *142*, 1053-1057.
- Bramness, J. G., Fixdal, T. C., & Vaglum, P. (1991). Effect of medical school stress on the mental health of medical students in early and late clinical curriculum. *Acta Psychiatrica Scandinavica*, *84*, 340-345.
- Brill, P. L. (1984). The need for an operational definition of burnout. *Family & Community Health*, *6*, 12-24.
- Buddeberg-Fischer, B., Stamm, M., Buddeberg, C., & Klaghofer, R. (2008). The new generation of family physicians--career motivation, life goals and work-life balance. *Swiss.Med.Wkly.*, *138*, 305-312.
- Butterfield, P. S. (1988). The stress of residency. A review of the literature. *Archives of Internal Medicine*, *148*, 1428-1435.
- Campbell, D. J., Sonnad, S., Eckhaser, F., Campbell, K., & Greenfield, L. (2001). Burnout among American surgeons. *Surgery*, *130*, 696-702.
- Cannon, W. (1932). *The wisdom of the body*. New York: Norton & Company.
- Caplan, R. D., Cobb, S., French, J. P. R., Van Harrison, R., & Pinneau, S. R. (1975). *Job demands and worker health*. (Rep. No. 75-168). Cincinnati, OH: National Institute for Occupational Safety and Health.
- Cherniss, C. (1995). *Beyond burn-out. Helping teachers, nurses, therapists, and lawyers recover from stress and disillusionment*. New York: Routledge.

- Chew-Graham, C. A., Rogers, A., & Yassin, N. (2003). 'I wouldn't want it on my CV or their records': medical students' experiences of help-seeking for mental health problems. *Medical Education*, *37*, 873-880.
- Clark, D. C. & Zeldow, P. B. (1988). Vicissitudes of depressed mood during four years of medical school [see comments]. *JAMA*, *260*, 2521-2528.
- Cooper, C. L., Rout, U., & Faragher, B. (1989). Mental health, job satisfaction, and job stress among general practitioners. *BMJ*, *298*, 366-370.
- Costa P.T.Jr & McCrae R.R. (1995). Primary Traits of Eysenck's P-E-N System: Three- and Five-Factor Solutions. *Journal of Personality and Social Psychology*, *69*, 308-317.
- Costa, P. T., McCrae, R. R., & Dye, D. A. (1991). Facet scales for agreeableness and conscientiousness: A revision of the NEO personality inventory. *Personality and Individual Differences*, *12*, 887-898.
- Costa, P. T. J., Sommerfield, M. R., & McCrae, R. R. (1996). Personality and coping: A reconceptualization. In M. Zeidner & N. S. Endler (Eds.), *Handbook of coping* (pp. 44-61). New York: John Wiley.
- Dahlin, M., Joneborg, N., & Runeson, B. (2005). Stress and depression among medical students: a cross-sectional study. *Medical Education*, *39*, 594-604.
- Dahlin, M. & Runeson, B. (2007). Burnout and psychiatric morbidity among medical students entering clinical training: a three year prospective questionnaire and interview-based study. *BMC Medical Education*, *7*, 6.

- Daly, M. G. & Willcock, S. M. (2002). Examining stress and responses to stress in medical students and new medical graduates. *Medical Journal of Australia*, 177 Suppl, S14-S15.
- de Lange, A. H., Taris, T. W., Kompier, M. A. J., Houtman, I. L. D., & Bongers, P. M. (2004). The relationships between work characteristics and mental health: examining normal, reversed and reciprocal relationships in a 4-wave study. *Work & Stress*, 18, 149-166.
- De Raad, B., Perugini, M., & Szirmak, Z. (1997). In pursuit of a cross-lingual reference structure of personality traits: Comparisons among five languages. *European Journal of Personality*, 11, 167-185.
- Demerouti, E. (2006). Job characteristics, flow, and performance. The moderating role of conscientiousness. *Journal of Occupational Health Psychology*, 11, 266-280.
- Demerouti, E., Bakker, A. B., & Bulters, A. J. (2004). The loss spiral of work pressure, work-home interference and exhaustion: reciprocal relations in a three wave study. *J Vocat Behav*, 64, 131-149.
- Depue, R. A. & Monroe, S. M. (1986). Conceptualization and measurement of human disorder in life stress research: the problem of chronic disturbance. *Psychol Bull.*, 99, 36-51.
- Dormann, C. & Zapf, D. (2002). Social stressors at work, irritation, and depressive symptoms: Accounting for unmeasured third variables in a multi-wave study. *Journal of Occupational and Organizational Psychology.*, 75, 33-58.

- Dyrbye, L., Thomas, M. R., Massie, F. S., Power, D. V., Eacker, A., Harper, W. et al. (2008). Burnout and suicidal ideation among U.S. medical students. *Annals of Internal Medicine*, 149, 334-341.
- Dyrbye, L., Thomas, M., & Shanafelt, T. (2006). Systematic Review of Depression, Anxiety, and Other Indicators of Psychological Distress Among U.S. and Canadian Medical Students. *Academic Medicine*, 81, 354.
- Eriksen, W., Bruusgaard, D., & Knardahl, S. (2003). Work factors as predictors of sickness absence: a three month prospective study of nurses' aides. *Occupational and Environmental Medicine*, 60, 271-278.
- Evans, J., Lee, P., Goldacre, M. J., & Lambert, T. W. (2004). Pre-registration house officers' comments on working in the NHS: a qualitative study of the views of UK medical graduates of 1999. *Medical Teacher*, 26, 250-255.
- Eysenck, H. J. (1947). *Dimensions of personality*. Oxford, England: K. Paul, Trench, Trubner.
- Eysenck, H. J. (1991). Dimensions of personality: 16, 5, or 3?--Criteria for a taxonomic paradigm. *Personality and Individual Differences*, 12, 773-790.
- Eysenck, H. J. (1994). The Big Five or giant three: Criteria for a paradigm. In C.R.Jr.Halverson, G. A. Kohnstamm, & R. P. Martin (Eds.), *The developing structure of temperament and personality from infancy to adulthood* (pp. 37-51). Hillsdale, NJ: Laurence Erlbaum.
- Falkum, E. (1996). Norwegian doctors today: Psychosocial work-environment and job satisfaction. In Ø.Larsen (Ed.), *The Shaping of a Profession: Physicians in Norway, Past and Present* (pp. 481-490). Canton, MA, USA: Science History Publications.

- Falkum, E., Gjerberg, E., Hofoss, D., & Aasland, O. G. (1997). Tidspress blant norske leger [Time stress among Norwegian physicians]. *Tidsskrift for Den Norske Laegeforening*, *117*, 954-959.
- Firth-Cozens, J. (1987). Emotional distress in junior house officers. *BMJ*, *295*, 533-536.
- Firth-Cozens, J. (1990). Sources of stress in women junior house officers. *British Medical Journal*, *301*, 89-91.
- Freeborn, D. K. (2001). Satisfaction, commitment, and psychological well-being among HMO physicians. *Western Journal of Medicine*, *174*, 13-18.
- French, J. & Kahn, R. (1962). A programmatic approach to studying the industrial environment and mental health. *The Journal of Social Issues*, *18*, 147.
- Freudenberger, H. (1975). The staff burn-out syndrome in alternative institutions. 1975,12 72-86. *Psychotherapy: Theory, Research and Practice*, *12*, 86.
- Frone, M. R., Russell, M., & Cooper, M. L. (1992). Antecedents and outcomes of work-family conflict: testing a model of the work-family interface. *Journal of Applied Psychology*, *77*, 65-78.
- Gabbard, G. O. (1985). The role of compulsiveness in the normal physician. *JAMA*, *254*, 2926-2929.
- Gabbard, G. O. & Menninger, R. (1988). The psychology of the physician. In G.O.Gabbard & R. Menninger (Eds.), *Medical marriages* (pp. 23-38). American Psychiatric Pub.

- Gelfand, D. V., Podnos, Y. D., Carmichael, J. C., Saltzman, D. J., Wilson, S. E., & Williams, R. A. (2004). Effect of the 80-Hour Workweek on Resident Burnout. *Archives of Surgery, 139*, 933-940.
- Geurts, S., Rutte, C., & Peeters, M. (1999). Antecedents and consequences of work-home interference among medical residents. *Social Science & Medicine, 48*, 1135-1148.
- Girard, D. E., Hickam, D. H., Gordon, G. H., & Robison, R. O. (1991). A prospective study of internal medicine residents' emotions and attitudes throughout their training. *Academic Medicine, 66*, 111-114.
- Gjerberg, E. (2003). Women doctors in Norway: the challenging balance between career and family life. *Social Science & Medicine, 57*, 1327-1341.
- Goitein, L., Shanafelt, T. D., Wipf, J. E., Slatore, C. G., & Back, A. L. (2005). The effects of work-hour limitations on resident well-being, patient care, and education in an internal medicine residency program. *Archives of Internal Medicine, 165*(22):2601-6, -26.
- Goodwin, R. D., Hoven, C. W., Lyons, J. S., & Stein, M. B. (2002). Mental health service utilization in the United States. The role of personality factors. *Social Psychiatry & Psychiatric Epidemiology, 37*, 561-566.
- Gopal, R., Glasheen, J. J., Miyoshi, T. J., & Prochazka, A. V. (2005). Burnout and Internal Medicine Resident Work-Hour Restrictions. *Archives of Internal Medicine, 165*, 2595-2600.
- GraphPad Software (2002). QuickCalcs Online Calculators for Scientists (Version 2002 - 2005) [Computer software]. 2236 Avenida de la Playa, La Jolla, CA 92037 USA: GraphPad Software, Inc.

- Greenhaus, J. & Beutel, N. (1985). Sources of conflict between work and family roles. *Academy of Management Review*, 10, 76-88.
- Grzywacz, J. G. & Marks, N. F. (2000). Family, work, work-family spillover, and problem drinking during midlife. *Journal of Marriage and the Family*, 62, 336-348.
- Guthrie, E., Black, D., Bagalkote, H., Shaw, C., Campbell, M., & Creed, F. (1998). Psychological stress and burnout in medical students: a five-year prospective longitudinal study. *Journal of the Royal Society of Medicine*, 91, 237-243.
- Hem, E., Stokke, G., Tyssen, R., Grønvold, N., Vaglum, P., & Ekeberg, Ø. (2005). Self-prescribing among young Norwegian doctors: a nine-year follow-up study of a nationwide sample. *BMC Medicine*, 3, 16.
- Hem, E., Haldorsen, T., Aasland, O. G., Tyssen, R., Vaglum, P., & Ekeberg, Ø. (2004). Suicide rates according to education with a particular focus on physicians in Norway 1960-2000. *Submitted for publication*.
- Hillhouse, J. J., Adler, C. M., & Walters, D. N. (2000). A simple model of stress, burnout and symptomatology in medical residents: a longitudinal study. *Psychology, Health & Medicine*, 5, 63-73.
- Hojat, M., Callahan, C. A., & Gonnella, J. S. (2004). Students' personality and ratings of clinical competence in medical school clerkships: a longitudinal study. *Psychology, Health & Medicine*, 9, 247-252.
- Hojat, M., Robeson, M., Damjanov, I., Veloski, J. J., Glaser, K., & Gonnella, J. S. (1993). Students' psychosocial characteristics as predictors of academic performance in medical school. *Academic Medicine*, 68, 635-637.

- Holroyd, K. & Lazarus, R. (1982). Stress, coping, and somatic adaptation. In L. Goldberger & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects* (Lazarus R & Holroyd K (1982) Stress, coping and somatic adaptation
In *Handbook of Stress Theoretical and Clinical Aspects*
(Goldberger L & Breznitz S eds), Collier-MacMillan, London,
pp 21-31 ed., pp. 21-31). London: Collier-MacMillan.
- Hsu, K. & Marshall, V. (1987). Prevalence of depression and distress in a large sample of Canadian residents, interns, and fellows. *American Journal of Psychiatry*, 144, 1561-1566.
- Hurrell Jr, J., Nelson, D., & Simmons, B. (1998). Measuring job stressors and strains: Where we have been, where we are, and where we need to go. *Journal of Occupational Health Psychology*, 3, 368-389.
- Innstrand, S. T., Langballe, E. M., Espnes, G. A., Falkum, E., & Aasland, O. G. (2008). Positive and negative work--family interaction and burnout: A longitudinal study of reciprocal relations. *Work & Stress* 22[1], 1-15.
Ref Type: Generic
- Jelinek, J. & Morf, M. E. (1995). Accounting for variance shared by measures of personality and stress-related variables: A canonical correlation analysis. *Psychological Reports*, 76, 959-962.
- Johnson, J. V. & Hall, E. M. (1988). Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *Am J Public Health*, 78, 1336-1342.

- Johnson, J., Hall, E., & Theorell, T. (1989). Combined effects of job strain and social isolation on cardiovascular disease morbidity and mortality in a random sample of the Swedish male working population. *Scandinavian Journal of Work, Environment & Health, 15*, 271-279.
- Johnson, W. D. (1991). Predisposition to emotional distress and psychiatric illness amongst doctors: the role of unconscious and experiential factors. [Review] [64 refs]. *British Journal of Medical Psychology, 64*, 317-329.
- Kaldestad, E. (1994). A re-evaluation of the psychometric properties of the Basic Character Inventory. *Scandinavian Journal of Psychology 35*[2], 165-174.
Ref Type: Generic
- Kapur, N., Borrill, C., & Stride, C. (1998). Psychological morbidity and job satisfaction in hospital consultants and junior house officers: multicentre, cross sectional survey. *BMJ, 317*, 511-512.
- Karasek, R. & Theorell, T. (1990). *Healthy work. Stress, productivity, and the reconstruction of working life*. Basic Books/Harper Collins.
- Kash, K. M., Holland, J. C., Breitbart, W., Berenson, S., Dougherty, J., Ouellette-Kobasa, S. et al. (2000). Stress and burnout in oncology. *Oncology (Huntington NY), 14*, 1621-1633.
- King, M. B., Cockcroft, A., & Gooch, C. (1992). Emotional distress in doctors: sources, effects and help sought. *Journal of the Royal Society of Medicine, 85*, 605-608.

- Kivimaki, M., Sutinen, R., Elovainio, M., Vahtera, J., Rasanen, K., Toyry, S. et al. (2001).
Sickness absence in hospital physicians: 2 year follow up study on determinants.
Occupational and Environmental Medicine, 58, 361-366.
- Langballe, E. M., Falkum, E., Innstrand, S. T., & Aasland, O. G. (2006). The Factorial
Validity of the Maslach Burnout Inventory-General Survey in Representative Samples
of Eight Different Occupational Groups. *Journal of Career Assessment*, 14, 370-384.
- Langballe, E. M., Innstrand, S. T., Falkum, E., Hagtvedt, K. A., & Aasland, O. G. Burnout
and work-related sickness absence. A longitudinal study among seven different
occupational groups in Norway. *European Journal of Work and Organizational
Psychology*, (in press).
- Lau, B., Hem, E., Berg, A. M., Ekeberg, Ø., & Torgersen, S. (2006). Personality types,
coping, and stress in the Norwegian police service. *Personality and Individual
Differences*, 41, 971-982.
- Lazare, A., Klerman, G. L., & Armor, D. J. (1966). Oral, obsessive, and hysterical personality
patterns. An investigation of psychoanalytic concepts by means of factor analysis.
Archives of General Psychiatry, 14, 624-630.
- Lazarus, R. S. (1966). *Psychological Stress and the Coping Process*. New York: McGraw-
Hill.
- Lederer, W., Kinzl, J. F., Traweger, C., Dosch, J., & Sumann, G. (2008). Fully developed
burnout and burnout risk in intensive care personnel at a university hospital.
Anaesthesia and Intensive Care, 36, 208-213.

- Lee-Baggley, D., Preece, M., & DeLongis, A. (2005). Coping With Interpersonal Stress: Role of Big Five Traits. *Journal of Personality, 73*, 1141-1180.
- Lemkau, J. P., Purdy, R. R., Rafferty, J. P., & Rudisill, J. R. (1988). Correlates of burnout among family practice residents. *Journal of Medical Education, 63*, 682-691.
- Lievens, F., Coetsier, P., De Fruit, F., & De Maeseneer, J. (2002). Medical students' personality characteristics and academic performance: a five-factor model perspective. *Medical Education, 36*, 1050-1056.
- Lindeman, S., Laara, E., Hakko, H., & Lonnqvist, J. (1996). A systematic review on gender-specific suicide mortality in medical doctors. *British Journal of Psychiatry, 168*, 274-279.
- Linzer, M., Visser, M. R., Oort, F. J., Smets, E. M., McMurray, J. E., & de Haes, H. C. (2001). Predicting and preventing physician burnout: results from the United States and the Netherlands. *American Journal of Medicine, 111*, 170-175.
- Lloyd, C. & Gartrell, N. K. (1981). Sex differences in medical student mental health. *American Journal of Psychiatry, 138*, 1346-1351.
- Martini, S., Arfken, C. L., Churchill, A., & Balon, R. (2004). Burnout comparison among residents in different medical specialties. *Academic Psychiatry, 28*, 240-242.
- Maslach & Schaufeli, W. (1993). Historical and conceptual development of burnout. In W.B.Schaufeli, C. Maslach, & T. Marek (Eds.), *Professional burnout: Recent developments in theory and research* (pp. 1-16). Washington DC: Taylor & Francis.
- Maslach, C. (1976). Burned-out. *Human behaviour, 5*, 16-22.

- McCrae, R. R. & Costa, P. T. (1989). Reinterpreting the Myers-Briggs Type Indicator From the Perspective of the Five-Factor Model of Personality. *Journal of Personality, 57*, 17-40.
- McCranie, E. W. & Brandsma, J. M. (1988). Personality antecedents of burnout among middle-aged physicians. *Behavioral Medicine, 14*, 30-36.
- McCue, J. D. (1985). Influence of medical and premedical education on important personal qualities of physicians. *American Journal of Medicine, 78*, 985-991.
- McManus, I. C., Keeling, A., & Paice, E. (2004). Stress, burnout and doctors' attitudes to work are determined by personality and learning style: A twelve year longitudinal study of UK medical graduates. *BMC Med, 2*, 29.
- McMurray, J. E., Linzer, M., Konrad, T. R., Douglas, J., Shugerman, R., & Nelson, K. (2000). The Work Lives of Women Physicians. Results from the Physician Work Life Study. *Journal of General Internal Medicine, 15*, 372-380.
- Michie, S. & Williams, S. (2003). Reducing work related psychological ill health and sickness absence: a systematic literature review. *Occupational and Environmental Medicine, 60*, 3-9.
- Midtgaard, M., Ekeberg, Ī., Vaglum, P., & Tyssen, R. (2008). Mental health treatment needs for medical students: a national longitudinal study. *European Psychiatry, 23*, 505-511.
- Miller, K. & Clark, D. (2008). "Knife before Wife": an exploratory study of gender and the UK medical profession. *Journal of Health Organisation and Management, 22*, 238-253.

- Mitchell, M., Srinivasan, M., West, DC., Franks, P., Keenan, C., Henderson, M. et al. (2005). Factors Affecting Resident Performance: Development of a Theoretical Model and a Focused Literature Review. *Academic Medicine*, 80, 376-389.
- Neilands, T. B., Silvera, D. H., Perry, J. A., Richardsen, A., & Holte, A. (2008). A validation and short form of the Basic Character Inventory. *Scandinavian Journal of Psychology*, 49, 161-168.
- Niemi, P. M. & Vainiomaki, P. T. (2006). Medical students' distress--quality, continuity and gender differences during a six-year medical programme. *Medical Teacher*, 28, 136-141.
- Niku, K. (2004). Resident Burnout. *JAMA*, 292, 2880-2889.
- Nyssen, A. S., Hansez, I., Baele, P., Lamy, M., & De Keyser, V. (2003). Occupational stress and burnout in anaesthesia. *Br J Anaesth*, 90, 333-337.
- Peeters, M. C. W., Montgomery, A. J., Bakker, A. B., & Schaufeli, W. B. (2005). Balancing Work and Home: How Job and Home Demands Are Related to Burnout. *International Journal of Stress Management*, 12, 43-61.
- Peiro, J., González-Roma, V., Tordera, N., & Mañas, M. (2001). Does Role Stress predict burnout over time among health care professionals? *Psychology and Health*, 16, 511-525.
- Perry, J., David, S., Jan, H. R., & Arne, H. (2002). Are Oral, Obsessive, and Hysterical Personality Traits Related to Disturbed Eating Patterns? A General Population Study of 6,313 Men and Women. *Journal of Personality Assessment*, 78, 405-416.

- Peterson, U., Demerouti, E., Bergstrom, G., Samuelsson, M., Åsberg, M., & Nygren, Å. (2008). Work Characteristics and Sickness Absence in Burnout and Nonburnout Groups: A Study of Swedish Health Care Workers. *International Journal of Stress Management, 15*, 153-172.
- Podsakoff, P. M., MacKenzie, S. B., Paine, J. B., & Bachrach, D. G. (2000). Organizational citizenship behaviors: a critical review of the theoretical and empirical literature and suggestions for future research. *Journal of Management, 26*, 513-563.
- Prins, J. T., Hoekstra-Weebers, J. E. H. M., Gazendam-Donofrio, S. M., Van De Wiel, H. B. M., Sprangers, F., Jaspers, F. C. A. et al. (2007). The role of social support in burnout among Dutch medical residents. *Psychology, Health & Medicine, 12*, 1-6.
- Pullen, D., Lonie, C. E., Lyle, D. M., Cam, D. E., & Doughty, M. V. (1995). Medical care of doctors. *Medical Journal of Australia, 162*, 481, 484.
- Purdy, R. R., Lemkau, J. P., Rafferty, J. P., & Rudisill, J. R. (1987). Resident physicians in family practice: who's burned out and who knows? *Family Medicine, 19*, 203-208.
- Pyskoty, C. E., Richman, J. A., & Flaherty, J. A. (1990). Psychosocial assets and mental health of minority medical students. *Academic Medicine, 65*, 581-585.
- Radcliffe, C. & Lester, H. (2003). Perceived stress during undergraduate medical training: a qualitative study. *Medical Education, 37*, 32-38.
- Rafferty, J. P., Lemkau, J. P., Purdy, R. R., & Rudisill, J. R. (1986). Validity of the Maslach Burnout Inventory for family practice physicians. *Journal of Clinical Psychology, 42*, 488-492.

- Ravndal, E. & Vaglum, P. (1991). Changes in antisocial aggressiveness during treatment in a hierarchical therapeutic community. A prospective study of personality changes. *Acta Psychiatrica Scandinavica*. Vol.84(6)(pp 524-530), 1991., 524-530.
- Reuben, D. B. (1985). Depressive symptoms in medical house officers. Effects of level of training and work rotation. *Archives of Internal Medicine*, 145, 286-288.
- Richardson, A. M. & Burke, R. J. (1991). Occupational stress and job satisfaction among physicians: sex differences. *Social Science & Medicine*, 33, 1179-1187.
- Rø, K., Gude, T., Tyssen, R., & Aasland, O. G. (2008). Counselling for burnout in Norwegian doctors: one year cohort study. *BMJ*, 337, a2004.
- Rogelberg, S. G., Conway, J. M., Sederburg, M. E., Spitzmuller, C., Aziz, S., & Knight, W. E. (2003). Profiling active and passive nonrespondents to an organizational survey. *Journal of Applied Psychology*, 88, 1104-1114.
- Rosal, M. C., Ockene, I. S., Ockene, J. K., Barrett, S. V., Ma, Y., & Hebert, J. R. (1997). A longitudinal study of students' depression at one medical school. *Academic Medicine*, 72, 542-546.
- Rosvold, E. O. & Bjertness, E. (2002). Illness behaviour among Norwegian physicians. *Scand.J.Public Health*, 30, 125-132.
- Røvik, J. O., Tyssen, R., Hem, E., Gude, T., Falkum, E., Ekeberg, Ø. et al. Emotional exhaustion among early/career physicians: A nationwide nine-year longitudinal and comparative study of levels and predictors. *BMC Medical Education*, (in press).
- Røvik, J. O., Tyssen, R., Gude, T., Moum, T., Ekeberg, O., & Vaglum, P. (2007a). Exploring the interplay between personality dimensions: a comparison of the typological and the

- dimensional approach in stress research. *Personality and Individual Differences*, 42, 1255-1266.
- Røvik, J., Tyssen, R., Hem, E., Gude, T., Ekeberg, Ø., Moum, T. et al. (2007b). Job stress in young physicians with an emphasis on the work-home interface: a nine-year, nationwide and longitudinal study of its course and predictors. *Industrial Health*, 45, 662-671.
- Sargent, M. C., Sotile, W., Sotile, M. O., Rubash, H., & Barrack, R. L. (2004). Stress and coping among orthopaedic surgery residents and faculty. *Journal of Bone and Joint Surgery*, 86, 1579-1586.
- Saucier, G. & Goldberg, L. R. (2008). Lexical Studies of Indigenous Personality Factors: Premises, Products, and Prospects. *Journal of Personality*, 69, 847-879.
- Schernhammer, E. S. & Colditz, G. A. (2004). Suicide Rates Among Physicians: A Quantitative and Gender Assessment (Meta-Analysis). *American Journal of Psychiatry*, 161, 2295-2302.
- Selye, H. (1956). *The Stress of life*. New York: McGraw-Hill.
- Selye, H. (1974). *Stress without distress*. Philadelphia: J. B. Lippincott Co.
- Shanafelt, T. D., Bradley, K. A., Wipf, J. E., & Back, A. L. (2002). Burnout and self-reported patient care in an internal medicine residency program. *Annals of Internal Medicine*, 136, 358-367.
- Shanafelt, T. D., Sloan, J. A., & Habermann, T. M. (2003). The well-being of physicians. *American Journal of Medicine*, 114, 513-519.

- Shirom, A. (2005). Reflections on the study of burnout. *Work & Stress, 19*, 263-270.
- Spickard, A., Jr., Gabbe, S. G., & Christensen, J. F. (2002). Mid-career burnout in generalist and specialist physicians. *JAMA, 288*, 1447-1450.
- Spielberger, C. D. & Vagg, P. R. (1999). *Professional manual for the job stress survey*.
- Sterud, T., Hem, E., Lau, B., Ekeberg, &, & ivind (2008). Suicidal Ideation and Suicide Attempts in a Nationwide Sample of Operational Norwegian Ambulance Personnel. *Journal of Occupational Health, 50*, 406-414.
- Størksen, I., Røysamb, E., Moum, T., & Tambs, K. (2005). Adolescents with a childhood experience of parental divorce: a longitudinal study of mental health and adjustment. *Journal of Adolescence, 28*, 725-739.
- Strand, B. H., Dalgard, O. S., Tambs, K., & Rognerud, M. (2003). Measuring the mental health status of the Norwegian population: A comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). *Nordic Journal of Psychiatry, 57*, 113-118.
- Sutherland, V. J. & Cooper, C. L. (1992). Job stress, satisfaction, and mental health among general practitioners before and after introduction of new contract. *BMJ, 304*, 1545-1548.
- Szirmak, Z. & De Raad, B. (1994). Taxonomy and structure of Hungarian personality traits. *European Journal of Personality, 8*, 95-117.
- Tambs, K. & Moum, T. (1993). How well can a few questionnaire items indicate anxiety and depression? *Acta Psychiatrica Scandinavica, 87*, 364-367.

- Thompson, W. T., Cupples, M. E., Sibbett, C. H., Skan, D. I., & Bradley, T. (2001). Challenge of culture, conscience, and contract to general practitioners' care of their own health: qualitative study. *BMJ*, *323*, 728-731.
- Toppinen-Tanner, S., Ojarvi, A., Vaananen, A., Kalimo, R., & Jappinen, P. (2005). Burnout as a predictor of medically certified sick-leave absences and their diagnosed causes. *Behavioral Medicine*, *31*, 18-27.
- Torgersen, S. (1980a). Hereditary-environmental differentiation of general neurotic, obsessive, and impulsive hysterical personality traits. *Acta Geneticae Medicae et Gemellologiae*, *29*, 193-207.
- Torgersen, S. (1980b). The oral, obsessive, and hysterical personality syndromes. A study of hereditary and environmental factors by means of the twin method. *Archives of General Psychiatry*, *37*, 1272-1277.
- Torgersen, S. (1995). *Personlighet og personlighetsforstyrrelser [Personality and personality disorders] [In Norwegian]*. Oslo: Universitetsforlaget AS.
- Torgersen, S. & Alnaes, R. (1989). Localizing DSM-III personality disorders in a three-dimensional structural space. *Journal of personality disorders*, *3*, 274-281.
- Töyry, S., Räsänen, K., Kujala, S., Aarimaa, M., Juntunen, J., Kalimo, R. et al. (2000a). Self-reported health, illness, and self-care among Finnish physicians: A national survey [In Process Citation]. *Archives of Family Medicine*, *9*, 1079-1085.
- Töyry, S., Räsänen, K., Kujala, S., Aärimaa, M., Juntunen, J., Kalimo, R. et al. (2000b). Self-reported Health, Illness, and Self-care Among Finnish Physicians: A National Survey. *Archives of Family Medicine*, *9*, 1079-1085.

- Tyssen, R. (2001). Lege-pasient-forholdet når pasienten også er lege [The physician-patient relationship when the patient is a physician]. *Tidsskrift for Den Norske Laegeforening*, *121*, 3533-3535.
- Tyssen, R. (2007). Health problems and the use of health services among physicians: a review article with particular emphasis on Norwegian studies. *Industrial Health*, *45*, 599-610.
- Tyssen, R., Dolatowski, F., Thorkildsen, R. F., Røvik, J. O., Ekeberg, Ø., Hem, E. et al. (2007). Personality traits and types predict medical school stress: a six-year longitudinal and nationwide study. *Medical Education*, *41*, 781-787.
- Tyssen, R. & Vaglum, P. (2002). Mental Health Problems among Young Doctors: An Updated Review of Prospective Studies. *Harv.Rev.Psychiatry*, *10*, 154-165.
- Tyssen, R., Vaglum, P., Aasland, O. G., Grønvold, N. T., & Ekeberg, Ø. (1998). Use of alcohol to cope with tension, and its relation to gender, years in medical school and hazardous drinking: a study of two nation-wide Norwegian samples of medical students. *Addiction*, *93*, 1341-1349.
- Tyssen, R., Vaglum, P., Grønvold, N. T., & Ekeberg, Ø. (2000). The impact of job stress and working conditions on mental health problems among junior house officers. A nationwide Norwegian prospective cohort study. *Medical Education*, *34*, 374-384.
- Tyssen, R., Vaglum, P., Grønvold, N. T., & Ekeberg, O. (2001a). Suicidal ideation among medical students and young physicians: a nationwide and prospective study of prevalence and predictors. *Journal of Affective Disorders*, *64*, 69-79.

- Tyssen, R., Vaglum, P., Grønvold, N. T., & Ekeberg, Ø. (2005). The relative importance of individual and organizational factors for the prevention of job stress during internship: a nationwide and prospective study. *Medical Teacher, 27*, 726-731.
- Tyssen, R., Vaglum, P., Gronvold, N. T., & Ekeberg, O. O. (2001b). Factors in medical school that predict postgraduate mental health problems in need of treatment. A nationwide and longitudinal study. *Medical Education, 35*, 110-120.
- Vagg, P. R. & Spielberger, C. D. (1998). Occupational stress: Measuring job pressure and organizational support in the workplace. *Journal of Occupational Health Psychology, 3*, 294-305.
- Van Harrison, R. (1978). Person-environment fit and job stress. In C.L.Cooper & R. Payne (Eds.), *Stress at Work* (pp. 175-205). John Wiley.
- Vitaliano, P. P., Maiuro, R. D., Russo, J., & Mitchell, E. S. (1989). Medical student distress. A longitudinal study. *Journal of Nervous & Mental Disease, 177*, 70-76.
- Vitaliano, P. P., Russo, J., Carr, J. E., & Heerwagen, J. H. (1984). Medical school pressures and their relationship to anxiety. *Journal of Nervous & Mental Disease, 172*, 730-736.
- Vollrath, M. & Torgersen, S. (2002). Who takes health risks? A probe into eight personality types. *Personality and Individual Differences, 32*, 1185-1197.
- Vollrath, M. & Torgersen, S. (2000). Personality types and coping. *Personality and Individual Differences, 29*, 367-378.
- Wall, T. D., Bolden, R. I., Borrill, C. S., Carter, A. J., Golya, D. A., Hardy, G. E. et al. (1997). Minor psychiatric disorder in NHS trust staff: occupational and gender differences. *British Journal of Psychiatry, 171*, 519-523.

Watson, D. & Clark, L. A. (1992). On traits and temperament: General and specific factors of emotional experience and their relation to the five-factor model. *Journal of Personality*, 60, 441-476.

Watson, D. & Hubbard, B. (1996). Adaptational style and dispositional structure: Coping in the context of the five-factor model. *Journal of Personality*, 64, 737-774.

Willcock, S. M., Daly, M. G., Tennant, C. C., & Allard, B. J. (2004). Burnout and psychiatric morbidity in new medical graduates.[see comment]. *Medical Journal of Australia*.181(7):357-60.

This article is removed.

This article is removed.

This article is removed.

This article is removed.

This article is removed.