

Ruth Derdikman-Eiron

Symptoms of Anxiety and Depression and Psychosocial Function in Males and Females From Adolescence to Adulthood

Longitudinal Findings from the
Nord-Trøndelag Health Study

Thesis for the degree of Philosophiae Doctor

Trondheim, September 2012

Norwegian University of Science and Technology
Faculty of Medicine
Regional Centre for Child and Adolescent Mental Health



NTNU – Trondheim
Norwegian University of
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Angst- og depresjonssymptomer og psykososial funksjon hos gutter og jenter fra ungdomstid til voksen alder: Longitudinelle funn fra Helseundersøkelsen i Nord-Trøndelag

Sammendrag

I dette longitudinelle forskningsprosjektet utforsket vi den psykososiale funksjonen til ungdommer og unge voksne med og uten symptomer på angst og depresjon. Deltakerne ble vurdert på tre tidspunkter: 1995-97 - Young HUNT 1 (rundt 9000 deltakere), 2000-2001 - Young HUNT 2 (omtrent 2500 deltakere) og 2006 - HUNT 3 (1300 deltakere).

Vi fant at forekomsten av symptomer på angst og depresjon var høyere hos jenter enn hos gutter. Tidligere og vedvarende symptomer på angst og depresjon hadde imidlertid mer negative konsekvenser for gutter enn for jenter. I tversnittundersøkelsen var sammenhengene mellom slike symptomer og lavere subjektiv velvære og selvfølelse, større problemer med læring samt mindre hyppig samvær med venner, mer utbredt hos gutter enn hos jenter. Resultatene av den longitudinelle studien styrket og utvidet disse funnene ytterligere. Tidligere, nåværende eller vedvarende symptomer på angst og depresjon var forbundet med mer redusert funksjon hos gutter enn hos jenter. Symptomdebut mellom første undersøkelse og oppfølgingstidspunktet var relatert til mindre hyppig samvær med venner for gutter, men ikke for jenter. Dessuten hadde

gutter etter at symptomene bedret seg, fortsatt mer problemer med atferd og læring, de møtte venner sjeldnere og rapporterte lavere subjektiv velvære og selvfølelse enn gutter som ikke hadde symptomer på noen av tidspunktene. Ingen tilsvarende forskjeller ble funnet blant jentene.

Subjektiv velvære og hyppighet av samvær med venner i ungdomstida framsto som de viktigste prediktorene for fungering i voksen alder. Ungdommenes subjektive velvære predikerte samvær med venner for menn, jobbtilfredshet for kvinner og opplevelse av samfunnstilknytning for begge kjønn. Hyppighet av samvær med venner i ungdomstida predikerte støtte fra venner hos kvinner, og samboerskap i voksen alder hos begge kjønn.

Resultatene tilsier at en bør være oppmerksom på redusert fungering hos menn og kvinner med symptomer på angst og depresjon, både i utredning og i behandling.

Navn Kandidat: Ruth Derdikman-Eiron

Institutt: Regionsenter for barn og unges psykiske helse

Veiledere: Marit S. Indredavik og Odin Hjemdal

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להורי, גנית ושאול עירון

For my parents, Ganit and Shaul Eiron

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1. Acknowledgements

When a person starts a PhD project, she enters a journey – a journey into research, knowledge and meaning, but also a journey within herself; a journey into uncertainties and ambiguities, into moments of joy and frustration, challenging will power and persistence.

Personally, my PhD journey was also a very concrete journey, an experience of living in a foreign country, getting to know the people and the culture. I would not have been able to make this multi-faceted journey without the invaluable help and support of very many wonderful people. It is impossible to mention all of them, but I will try to mention some of the people who made this period so enriching and meaningful, and not the least, helped me feel at home.

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2. List of papers

- Paper 1: Derdikman-Eiron, R., Indredavik, M. S., Bratberg, G. H., Taraldsen, G., Bakken, I. J., & Colton, M. (2011). Gender differences in subjective well-being, self esteem and psychosocial functioning among adolescents with symptoms of anxiety and depression: findings from the Nord-Trøndelag health study. *Scandinavian Journal of Psychology*, 52(3), 261–267.
- Paper 2: Derdikman-Eiron, R., Indredavik, M. S., Bakken, I. J., Bratberg, G. H., Hjemdal, O., & Colton, M. Gender differences in psychosocial functioning of adolescents with symptoms of anxiety and depression: Longitudinal findings from the Nord-Trøndelag Health Study. *Social Psychiatry and Psychiatric Epidemiology*, [Epub ahead of print] <http://dx.doi: 10.1007/s00127-012-0492-y>.
- Paper 3: Derdikman-Eiron, R., Hjemdal, O., Lydersen, S., Bratberg, G. H., and Indredavik, M. S. Adolescent predictors and associates of psychosocial functioning in young men and women: 11 Year Follow-Up Findings from the Nord-Trøndelag Health Study. *Submitted*.

3. Introduction

3.1 Topic of the thesis

Anna and Tom are two 14-year-old adolescents. Both have recently developed symptoms of anxiety and depression. They feel sad, tensed and hopeless when thinking of their future. Has Tom and Anna's everyday routine been affected in the same way? Does either of them experience changes in their social relations – or in their ability to function at school? In a few years time – what will be the effect of the current symptoms on their psychosocial functioning, and will it differ across gender?

In this longitudinal research project, we explored psychosocial functioning of adolescents and young adults with symptoms of anxiety and depression. The participants were assessed at three time intervals: 1995–97; Young HUNT 1, 2000–2001; Young HUNT 2 and 2006–2008; HUNT 3.

The first study was a cross-sectional examination of the relations between current symptoms of anxiety and depression and subjective well-being, self-esteem and psychosocial functioning. In the second study, we conducted a longitudinal investigation of gender differences in subjective well-being, self-esteem and psychosocial functioning among adolescents, associated with the presence or absence of symptoms of anxiety and depression. In the third paper we explored the predictive role of anxiety and depression and psychosocial functioning in adolescence for adult

functioning. We also explored whether the prediction differed between men and women.

3.2 Rationale

The ability to function adaptively in society is a major developmental task which changes with age and is closely related to issues of mental health. The ability to be a productive member of society has even been suggested as a definition of mental health, and was concisely phrased by Sigmund Freud as the ability to love and to work (Erikson, 1950/1963, pp. 264-265). Moreover, most spheres of psychosocial functioning are negatively affected by anxiety and depression, and treatment often focuses on these impairments (Lewinsohn et al., 1994). Thus, mental health and psychosocial functioning are strongly related and may reciprocally influence each other (Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2003).

Despite the broad consensus on the importance of gender in anxiety and depression (Copeland, Shanahan, Costello, & Angold, 2009; Mazza et al., 2009; C. Zahn-Waxler, Shirtcliff, & Marceau, 2008), research on gender differences in psychosocial functioning among adolescents and adults with anxiety and depression is scarce (Crick & Zahn-Waxler, 2003; Scott & Collings, 2010). Identifying gender-specific psychosocial impairments in adolescents and adults with a current or previous history of anxiety and depression may contribute to more efficient assessment, prevention and intervention methods tailored separately to boys and girls.

3.3 Anxiety and depression in adolescent girls and boys

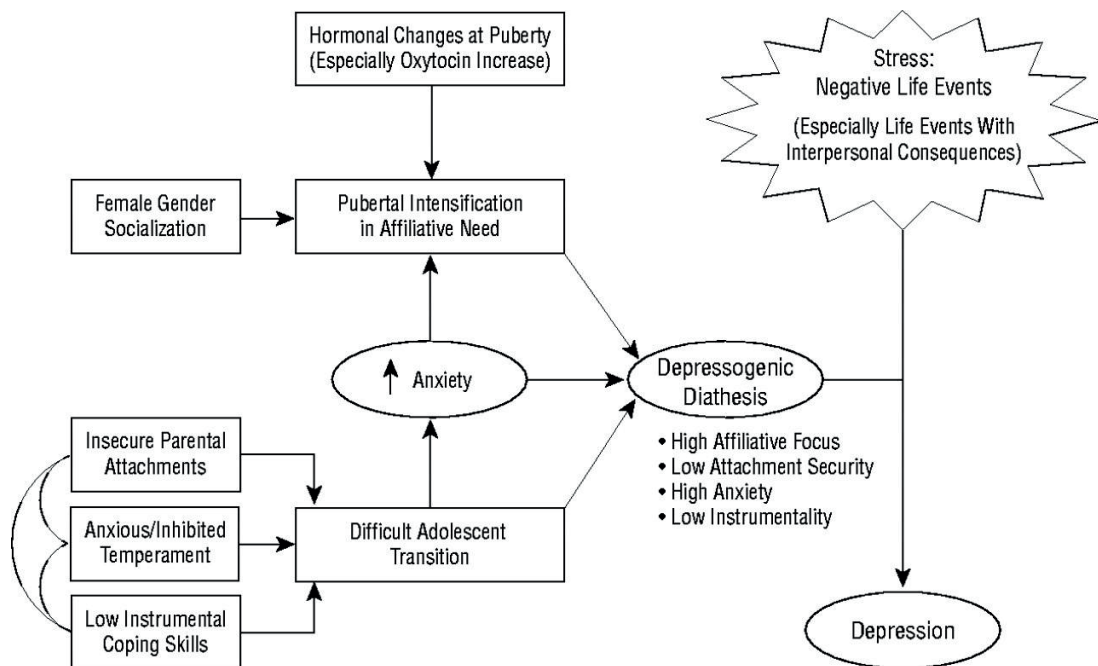
Depression is the most common mental disorder. It puts a heavy burden on society and is the leading psychiatric cause of disability (Costello, Egger, & Angold, 2005). Being depressed during childhood or adolescence increases the risk of depression in adulthood, especially when it is not treated (Jenkins & Curwen, 2008). Furthermore, co-morbidity of depression and other psychiatric disorders or physical diseases is common (Lewinsohn, et al., 2003). While anxiety is a separate phenomenon, much evidence supports extensive co-morbidity of anxiety and depression in childhood and adolescence (Anderson & Hope, 2008).

The prevalence of anxiety and depression symptoms varies largely according to the definitions of anxiety and depression and to the type of measurement used. Costello et al. (2005) summarized a large population-based study carried out from 1993 to 2005 and reported a prevalence of 18 per cent of any depressive disorder in children and adolescents aged 7–15 years. Using the Beck Depression Inventory (BDI) or the Centre for Epidemiological Studies Depression Scale (CES-D), rates are reported between 20–28 per cent for mildly depressed subjects, 9-10 per cent for moderately depressed and 1-4 per cent for severe depressive symptoms (Sund, 2004).

Before puberty, boys exhibit similar or somewhat elevated rates of anxiety and depression compared with girls (C. Zahn-Waxler, Crick, Shirliff, & Woods, 2006). During adolescence, a dramatic change occurs, and by the age of 15, girls are twice as likely as boys to have experienced an episode of depression. This gender gap is reported

to persist for the next 40 years (Cyranowski, Frank, Young, & Shear, 2000). While some argue that depression rates among adolescent boys are similar or even lower than rates among pre-pubertal boys (Jenkins & Curwen, 2008; Nolen-Hoeksema, 2001; Sund, 2004), others report an increase in depression rates among adolescent boys as well (Cyranowski, et al., 2000; Wichstrom, 1999). Elevated rates of symptoms of anxiety and depression among girls during puberty have drawn attention to the processes involved in that special period of girls' lives. Large changes in hormones and hormonal receptors, different courses of brain development across genders and interaction of these factors with genetics and environment have all been suggested as reasons for gender differences in adolescent anxiety and depression (Paus, Keshavan, & Giedd, 2008).

Several models have postulated links between physiological, cognitive and emotional changes and the interaction between these changes and factors related to female gender socialization. Frank, Cyranowski and colleagues (2000) proposed the following model in order to describe increased rates of depression in adolescent females:



Cyranowski, J. M. et al. Arch Gen Psychiatry 2000; 57:21–27. Figure reprinted with permission.

The model describes possible factors involved in developing depression and their inter-connections. Factors mentioned are pubertal –hormonal changes, innate traits, traits acquired in childhood, effects of female gender socialization, and negative life events.

The prevalence of adolescent depression differs between boys and girls, but it seems that symptom manifestation is similar across genders. Lewinsohn et al. (1998) reported that depressed boys and girls had a similar symptom rate in seven out of nine categories (depressed mood, sleep disturbances, thinking difficulty, anhedonia, motor

disturbance, loss of energy and thoughts of death or suicide). Weight/appetite disturbance and feelings of worthlessness or guilt were more prevalent among girls than among boys (Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998). Moreover, the researchers claim that controlling for psychosocial variables associated with gender significantly reduces the higher self-reported scores among girls, although this claim is controversial (Cyranowski, et al., 2000).

3.4. Subjective well-being and self-esteem of adolescent girls and boys with symptoms of anxiety and depression

In the current project, we have chosen to investigate two correlates of mental health, namely: subjective well-being and self-esteem.

Subjective well-being is a frequently used indicator of mental health, and is negatively correlated with depressive symptomatology. The concept refers to a personal, subjective evaluation as opposed to external criteria set by experts. It is comprised by individuals' multi-dimensional evaluation of their lives. It embraces a threefold structure, consisting of one cognitive component (life satisfaction) and the two affective components, including both the presence of positive affect, and the relative absence of negative affect. These components capture distinct aspects of subjective well-being but are not entirely independent and are assumed to reflect a single underlying dimension (Nes, Roysamb, Tambs, Harris, & Reichborn-Kjennerud, 2006).

The growing research in subjective well-being and similar contemporary constructs such as life satisfaction, optimism and quality of life, conveys the notion that mental health is not merely the absence of symptoms of distress. Recent research has demonstrated that subjective well-being reflects a distinct valid construct associated with reduced risk of psychological and social problems and with longevity and work satisfaction (Bray & Gunnell, 2006). Subjective well-being is considered to be a fairly stable trait across time, although influenced by immediate life circumstances (Nes, et al., 2006; Vaillant, 2003).

In the general population, adolescent boys usually report higher subjective well-being than girls (Nes, et al., 2006), while men report slightly higher or equal subjective well-being in comparison with women (Diener, Suh, Lucas, & Smith, 1999).

Self-esteem refers to a person's general sense of worth or acceptance and is an additional, complementary measurement of symptoms of anxiety and depression in mental health assessment. A decrease in self-esteem is one of the distinct symptoms of depression (American Psychiatric Association, 2000), and self-esteem is negatively correlated with both the presence and persistence of symptoms (Takakura & Sakihara, 2001). Self-esteem in adolescence is usually higher for boys than for girls and decreases with age in both genders (Polce-Lynch, Myers, Kliwer, & Kilmartin, 2001). So far, research reports have not specified whether symptoms of anxiety and depression affect subjective well-being and self-esteem of adolescent boys and girls differently.

3.5. Psychosocial functioning of adolescent girls and boys with symptoms of anxiety and depression

We have explored two aspects of psychosocial functioning: school functioning and relations with friends.

School functioning

There is very little evidence of gender differences in school functioning among adolescents with symptoms of anxiety and depression. However, two Norwegian studies found that lower functioning at school is correlated with symptoms of anxiety and depression in boys but not in girls (Storksen, Roysamb, Moum, & Tambs, 2005; Sund, Larsson, & Wichstrom, 2003). A recent report on a 15-year follow-up study found associations between adolescent depression and lower academic performance among young men, but not women (Jonsson et al., 2010). This was in contrast to another study that found the opposite (Berndt et al., 2000). Hence, the literature on associations between anxiety and depression and school functioning is inconsistent.

Social relations

Gender differences in social behaviour are well documented. Girls are reported to demonstrate greater social sensitivity and emotional regulation than boys from birth, and these differences seem to persist throughout the life span of the subjects (C. Zahn-Waxler, et al., 2008). The relationship between social capacities and anxiety and depression is twofold: girls are more concerned about general peer evaluation and are

more vulnerable to peer stress and rumination than boys, and this in turn exposes girls to a higher risk of emotional problems (Rose & Rudolph, 2006).

However, girls and women in general tend to express and reveal negative emotions such as sadness, anxiety and fear more than boys and men do, and females share their feelings with a broader range of people (Vigil, 2009). Some researchers have suggested that, for females, types of pro-social behaviours are adaptive, from an evolutionary point of view, but less so for men (Taylor et al., 2000; Vigil, Geary, Granger, & Flinn, 2010).

In line with these theories, researchers have reported social isolation and lack of social support to be more strongly associated with symptoms of anxiety and depression in young adolescent boys than in girls (Hunter, Waters, Pronk, & Zimmer-Gembeck, 2009; Larson, Richards, Raffaelli, Ham, & Jewell, 1990; Troop-Gordon & Ladd, 2005). The same phenomenon was reported by men with either mood or anxiety disorders; men experienced significantly more social disability than did women with these disorders (Scott & Collings, 2010).

3.6 Adolescent predictors of psychosocial functioning in adulthood

A large body of research has linked adult psychopathology with childhood and adolescent psychopathology. Less is known about relations between mental health problems in adolescence and psychosocial functioning in adulthood. Externalizing symptoms may have long term predictive significance for a variety of negative

outcomes such as antisocial behaviour, contacts with the judicial system, substance abuse and work instability (e.g. Capaldi & Stoolmiller, 1999). Co-morbid internalizing and externalizing problems in childhood presents the highest risk of both legal offenses and psychiatric disorders in adulthood among men (Sourander et al., 2007).

Furthermore, internalizing problems in adolescence presents a risk of internalizing problems in young adulthood and a risk of future problems in the area of interpersonal relationships (Capaldi & Stoolmiller, 1999; Lewinsohn, et al., 2003).

Accounting for psychosocial functioning in adolescence is important in prospective studies which aim to infer from adolescence to adulthood. However, only a few studies that have investigated adolescent predictors of adult functioning have included measures of adolescent functioning in addition to psychiatric symptoms. (Lewinsohn, et al., 2003). Reduced social functioning is considered to be a significant domain of impairment in individuals with depression and may act as both a precursor to and a consequence of depressive symptoms in adolescents (Allen et al., 2006). Although a large body of research has dealt with the relations between depression and social functioning, the literature on links between adolescence and early adulthood is scarce. Having more depressive symptoms at 15 years of age was associated with a proportional increase in relationship conflicts (2010).

Depression during adolescence was found to predict higher rates of early marriage among younger women and subsequent marital dissatisfaction (Gotlib, Lewinsohn, & Seeley, 1998).

Internalizing symptoms are usually prognostic for peer problems (Lewinsohn, et al., 2003). Since more girls exhibit internalizing symptoms, it is expected that more girls will report problems in peer relations. However, Burt & Roisman (2010) found no gender differences in the links between internalizing symptoms and social competence from childhood to young adulthood. Moreover, withdrawn and anxious girls may seem more socially agreeable than boys, and it seems that the gender gap in sociability increases with age (Masten & Curtis, 2000); Men with a childhood history of shyness were older than their male peers when they married, became fathers, and entered stable careers. The delay in beginning a stable career also appeared to have an adverse effect on marital stability. In the same study, women who had been shy in adolescence did not tend to have any distinct problems through midlife. On the contrary, they were more likely than other women in their cohort to follow a conventional pattern of marriage, childbearing, and homemaking. (Caspi, Elder, & Bem, 1988).

Similarly, little is known on gender differences in the relations between anxiety and depression and education and work attainments. A recent study found gender differences in predictors of low graduation rate in higher education. While adolescent depression predicted a low graduation rate among men, early school performance, socio-economical status and maternal education, (but not depression) were predictors for women (Jonsson, et al., 2010). Thus, adolescent depression and its consequences might be particularly devastating to subsequent higher education in men. However, an older study in the USA found the opposite (Berndt, et al.,

2000). Nonetheless, these studies differed in methodology, making it difficult to compare them.

4. Aims of the thesis

The aim of this research project was to explore subjective well-being, self-esteem and psychosocial functioning of adolescent boys and girls with symptoms of anxiety and depression. In addition, we aimed to investigate longitudinally whether their mental health and psychosocial functioning in adolescence could predict their psychosocial functioning as adults, and whether the prediction varied across gender. The aims were addressed in papers 1–3 as follows:

Aims of paper I: To explore gender-specific associations between symptoms of anxiety and depression, and subjective well-being, self-esteem and psychosocial functioning of adolescents. More specifically, we addressed the following questions:

1. What characterizes the subjective well-being, self-esteem and psychosocial functioning of boys and girls with and without symptoms of anxiety and depression?
2. Is gender a moderator variable in the associations between symptoms of anxiety and depression and subjective well-being, self-esteem, social relations, school functioning and behavior problems at school?

Aims of paper II: To investigate if gender is a mediator in subjective well-being, self-esteem and psychosocial functioning of adolescents with previous, current or both time-points presence of symptoms of anxiety and depression. More specifically, we wanted to explore if subjective well-being, self-esteem and psychosocial functioning are affected differently in boys and girls if:

1. Symptoms of anxiety and depression are present both at base line and at follow-up.
2. These symptoms emerge during adolescence (absent at baseline but present at follow-up).
3. These symptoms decline until remission between base line and follow-up.

Aims of paper III: To explore the relations between adolescent mental health and psychosocial functioning and adult psychosocial functioning in men and women.

The specific aims were to investigate whether:

1. Adolescent mental health predicts psychosocial functioning in adulthood.
2. Social relations and behaviour problems in school in adolescence predict psychosocial functioning in adulthood.
3. Gender was a moderator in the associations between adolescent mental health, social relations and behaviour problems in school and adult psychosocial functioning.

5. Methods

5.1 Study design and sample

Data were taken from the Nord-Trøndelag Health Study (HUNT), which is a longitudinal health survey of residents aged 13 and older of the county of Nord-Trøndelag, situated in Central Norway. The county has approximately 127,000 inhabitants. This research project is based on data from the first two waves of the adolescent part of the study (Young HUNT 1 and 2), and the third adult wave of the study (HUNT 3). Data for Young HUNT 1 were collected in 1995–1997; data for Young HUNT 2 were collected in 2000–2001, and HUNT 3 were collected in 2006–2008. Figure 1 is a flow chart of participants in the studies described in papers I and II, and Figure 2 is a flow chart for the study described in paper III.

Acquisition of the Young HUNT data was mainly organized through the local junior high schools and senior high schools. Participants in wave 1 (Young HUNT 1, T1) were in 8th through 13th grades (age range 12.1–17.4, mean = 14.4). These data were the basis for our first paper. Four years later, in wave 2 (T2), the 2714 wave 1 participants who were still in 12th or 13th grade (age range 16.7–21.0, mean=18.4) were invited to take part in a follow-up. Of these, 2354 (87%) provided complete data, including 1092 boys and 1262 girls. Data from the first and the second waves were used in our second paper.

In the third and last paper, participants of wave 1 who also completed HUNT 3 (T3) as adults were included. Of 3739 eligible baseline subjects, 1346 (36%) agreed to participate in a HUNT 3, 819 women and 517 men. The mean age was 26.9, range 19.0–31.0. We chose not to include data from Young HUNT 2 in this study, since we had only 400 participants who participated in all 3 waves.

Figure 1 Flow chart of study population for papers 1 and 2

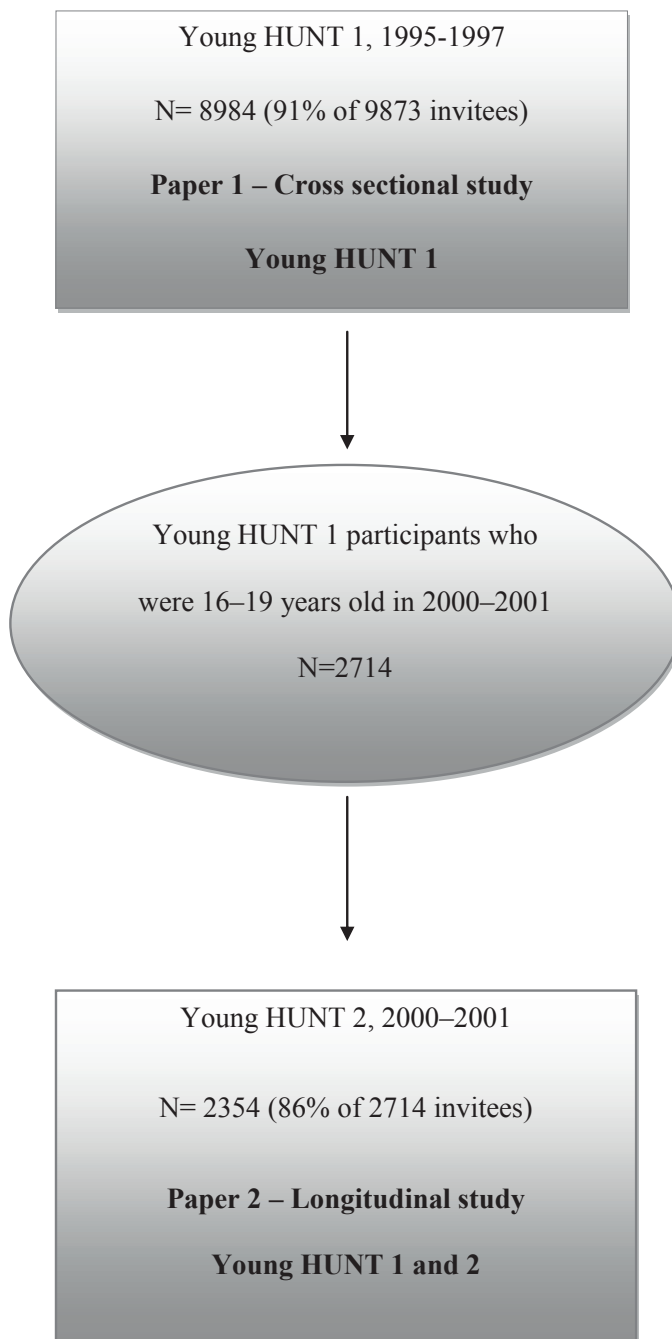
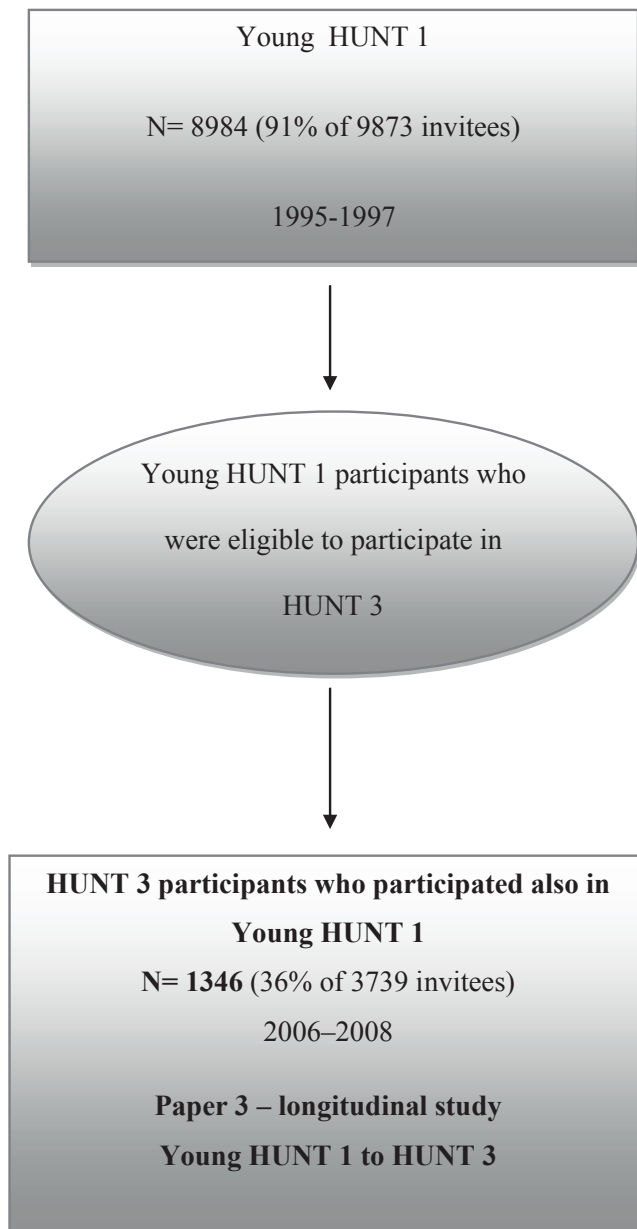


Figure 2 Flow chart of study population for paper 3



5.2 Measures

The full original questionnaires and their English translation are available on the HUNT website.

The Young Hunt questionnaire:

http://www.ntnu.no/c/document_library/get_file?uuid=11d90eff-3b09-4867-9c8c-54d8d7738783&groupId=10304

The Adult HUNT questionnaires:

We used the general questionnaire and the supplementary questionnaires for women and men aged 20–29. They can be obtained at:

http://www.ntnu.no/c/document_library/get_file?uuid=f9e499bf-e3d4-4cd0-925e-a5231cf9cf6e&groupId=10304 (Retrieved 19 July 2011).

Adolescent Variables

These variables were taken from the Young HUNT 1 and 2 questionnaires, which are identical and have been used in papers I and II, and partially in paper III.

Symptoms of anxiety and depression were measured by a shortened version of the Symptom Check List 25 for anxiety and depression (SCL 25). The short version, SCL 5, is a widely used self-administered questionnaire (Derogatis, 1983; Strand, Dalgard, Tambs, & Rognerud, 2003). It has been translated into Norwegian and validated in the local population from the age of 16 (Tambs & Moum, 1993). Its

reliability has been shown to be acceptable, and a mean cutoff score of SCL 5 > 2 has been suggested (Strand, et al., 2003) to account for the same prevalence rates of anxiety and depression as in the original SCL 25 questionnaire. This cutoff score was applied in the present study to define the presence of symptoms of anxiety and depression. In the SCL 5, participants are asked to rate, using a four-point Likert scale, the extent to which they have been bothered by the following thoughts and feelings during the previous 14 days: “felt consistently afraid and anxious”; “felt tense or uneasy”; “felt hopelessness when thinking about the future”; “felt depressed or sad” and “worried too much about various things”. The scale ranges from “not bothered” (1) to “very bothered” (4). In the present study, the SCL 5 Cronbach’s alpha was 0.77.

Academic problems and behaviour problems at school were measured as part of school-related questions designed by the Norwegian Institute of Public Health. Participants were asked to consider 14 statements about school and to respond according to a four-point scale ranging from “never” (1) to “very often” (4). In a previous study using the Young HUNT 1 and 2 data, these 14 statements were subjected to factor analysis (Storksen, Roysamb, Holmen, & Tambs, 2006). The present study used two of these factors: “Academic problems” with 5 items (highest loading item: “I have problems concentrating in class”) and “Behaviour problems in school” with 4 items (highest loading item: “I am reprimanded by my teacher”). Cronbach’s alphas, based on standardized items for these factors, were 0.67 and 0.64, respectively. High scores indicate more problems than low scores.

The social relations of the respondents were examined by two questions: (1) “Do you feel you have enough friends?” (yes/no) and (2) “How frequently do you meet your friends?” The latter variable was calculated by taking the mean frequency of paying and receiving visits in the last week. Possible answers ranged from never (1) to four or more times (4). These questions were specifically designed for the HUNT study by the Norwegian Institute for Public Health.

The subjective well-being scale consisted of the following three questions: (a) “When you think about the way your life is going at present, would you say that you are by and large satisfied with life or are you mostly dissatisfied?”, (b) “In general, do you feel strong and in a good mood or tired and worn out?” and (c) “Are you generally happy or sad?” Respondents answered according to a seven-point scale ranging from the extreme negative (1) to the extreme positive (7). The subjective well-being scale has been reported in previous HUNT study publications (Moum, Naess, Sorensen, Tambs, & Holmen, 1990). In the present study, it had an associated Cronbach’s alpha of 0.74. Higher values indicate better subjective well-being.

Self-esteem was measured by a short version of the Rosenberg Self-Esteem Scale (Rosenberg, 1965), consisting of the following four statements: “I have a positive attitude toward myself”; “ I feel rather useless at times”; “I feel that I don’t have much to be proud of” and “I feel that I am a valuable person, at least equal to other people”. Respondents answered in terms of a four-point scale ranging from “I totally agree” (1) to “I totally disagree” (4). Scores were inversed in the first and last item. As such,

higher scores refer to higher self-esteem. A high degree of correlation (0.95) has been reported between the four-item version and the original scale, in a validation study with Norwegian adolescents (Ystgaard, 1993). In the present study, a Cronbach's alpha of 0.74 was obtained for the four-item scale. High scores correspond to high self-esteem.

Socio-economic status (SES) was measured by the variables of parents' education and income, which were obtained from Statistics Norway for each participant. Parents' educational level was divided into six ascending categories according to the length and type of education, ranging from "up to four years of elementary school" (0) to "Master's degree or above" (6). The composite variable was the mean score of both parents' education. The correlation between educational level and income was 0.49. Educational level contributed more to the explained variance, and thus was chosen as an indicator of SES.

Adult Variables

These variables were used in paper 3.

The **cohabitation** variable refers to one question – Living with a spouse (husband/wife or cohabitant) (0) or not (1).

Friends support was measured by two dichotomous variables: "Do you have friends that can help you when you need them?" (no (0), yes (1)). "Do you have friends that you can speak to confidentially?" (no (0), yes (1)). The final sum scores were

dichotomized where a total score of 0 and 1 were scored as 0, and the total score of 2 was scored as 1.

The Community connectedness scale was a sum of three items: “I feel a strong sense of community with the people who live here”; ”We do not trust each other here”; “People like living here”. Possible answers varied from “strongly disagree” (1) to ”strongly agree” (5). The scoring was inversed for the second item. Thus, a high sum score indicates strong connectedness. The scale reached a Cronbach alpha of 0.64.

Work satisfaction was measured by one variable: All things considered, how much do you enjoy your work? Answers ranged from not at all (1) to very much (4).

Socio-economic status (SES) was measured by the variables of participants’ educational level and income in adulthood, which were obtained from Statistics Norway. Income was not a valid measurement, as participants who were receiving student loans from the government were classified as having a negative income. Hence it was decided to use educational level as the indicator for SES, which was also found to be a reliable indicator for SES in our previous papers.

5.3 Ethics

The adolescents and adult participants signed a written consent to participate at each time point. In addition, students younger than 16 years of age were asked to provide parental consent. Participants were instructed to complete the questionnaires

individually. The questionnaires were identifiable by a bar code with the respondents' 11-digit personal identification number, which was encrypted to secure anonymity. The Regional Committee for Medical and Health Research Ethics of Central Norway had approved the study protocol, approvals no. 4.2007.2416 for the first two papers, and approval no. 2009/16594 for the third paper.

5.4 Statistical analysis

Data analyses were undertaken using SPSS for Windows version 16.0 for papers 1 and 2 (SPSS Inc, Chicago, IL). Paper 3 data analyses were undertaken using the IBM SPSS Statistics, version 18.0.

Statistical analyses in Paper I

Changes of prevalence in respect of gender and age were examined using separate logistic regression analyses for each gender. The dependent variable in logistic regression was presence of anxiety and depressive symptoms (1) versus absence of such symptoms (0), with age as the independent variable. Due to a large number of participants, the significance level for all the analyses was set to $p < .01$.

T-test and chi-square tests were used to compare mean scores of SCL 5 of boys and girls who reported symptoms of anxiety and depression (SCL 5 score > 2), and mean

scores of those who reported no symptoms (SCL 5 score ≤ 2) for an exploratory analysis of gender differences.

We used multiple linear regression analyses in order to investigate whether the impact of the SCL 5 score was modified by gender. This was done by performing five regression analyses. The independent variables were SCL 5 score as a continuous variable, age, gender and the interaction between gender and SCL 5 score. The respective dependent variables were subjective well-being, self-esteem, academic problems at school, behaviour problems at school and spending time with friends. These analyses were controlled for possible confounders such as age and parents' educational level. The impact of symptoms of anxiety and depression for each gender was analysed by performing the same regression analyses for each gender separately.

Similarly, we checked whether the impact of the SCL 5 score on “the feeling of not having enough friends” was modified by gender. It was done by a logistic regression analysis that also included gender and the interaction between gender and SCL 5 score, and was controlled for age and parents' educational level. We also performed the same analysis separately for each gender.

Statistical analyses in Paper II

In order to examine patterns of change in symptoms of anxiety and depression over time, the sample was divided into four symptom groups:

1. *Both waves group* – Presence of symptoms at baseline (T1) and follow-up (T2).
2. *Onset group* – Absence of symptoms at baseline (T1), presence at follow-up (T2).

3. *Remission group* – Presence of symptoms at baseline (T1), absence at follow-up (T2).
4. *No symptoms group* – Absence of symptoms at both waves.

The prevalence of symptoms of anxiety and depression in both waves was calculated, and the numbers of boys and girls in each of the analyzed symptom groups were compared using a chi-square test.

Differences in psychosocial functioning, subjective well-being and self-esteem between boys and girls at follow-up with respect to their previous or current presence of symptoms of anxiety and depression were analysed by a set of ANCOVAs. Each analysis was performed with one of the following variables at follow-up as its outcome: Academic problems, behaviour problems at school, frequency of meeting friends, subjective well-being and self-esteem; the explanatory variables were symptoms of anxiety and depression group, gender and the interaction between gender and symptom group. The model's covariates were age and parents' educational level. In the same set of analyses, we further compared psychosocial functioning, subjective well-being and self-esteem of boys and girls within each symptom group by calculating estimated marginal means with confidence intervals for each outcome variable.

Statistical analyses in Paper III

The prevalence of symptoms of anxiety and depression in adolescence was calculated, and the numbers of females and males in each group were compared using a chi-square test.

Binary logistic regression models were used to examine friends support and cohabitation. A linear regression model was used to investigate community connectedness, and ordinal a logistic regression model was used to explore work satisfaction. The independent variables were symptoms of anxiety and depression score, subjective well-being, frequency of meeting friends and behaviour problems at school.

Analyses were carried out separately for women and men in two stages for each outcome variable. In the first stage, each independent variable was entered separately into the regression model, and in the second stage we entered all the predicting variables into a combined model for each outcome variable. In addition, we checked whether interactions existed between gender and the predicting variables by entering each independent variable separately with gender and the interaction between this variable and gender. These analyses were carried for the whole sample, men and women, together. All analyses were adjusted for age. In addition, we performed alternative analyses adjusting for educational level. However, these gave practically the same results and were therefore not reported.

6. Main Results

6.1 Prevalence of symptoms of anxiety and depression

Table 1. Prevalence of symptoms of anxiety and depression in the various waves

Sample	Prevalence		
	($\%$)		
	Girls/Women	Boys/Men	Both
	genders		
Young Hunt 1	14.7	5.8***	9.2
Mean age =14.4			
SD = 0.89			
Young Hunt 2	19.4	7.8***	13.4
Mean age =18.4			
SD = 0.79			
HUNT 3	12.3	8.0***	10.7
Mean age =26.9			
SD = 2.06			

***Comparisons between boys and girls, $p < 0.001$

All gender differences in prevalence were significant, $p < 0.001$. It was not possible to analyze the differences in prevalence since the samples are partially overlapping. However, the prevalence of symptoms of anxiety and depression in both genders is higher in late adolescence than in early adolescence. The descriptive numbers for women indicated a higher prevalence in late adolescence than in early adulthood and for men, a stable prevalence across these periods.

6.2 Paper I

Gender Differences in Subjective Well-Being, Self-Esteem and Psychosocial Functioning in Adolescents with Symptoms of Anxiety and Depression: findings from the Nord-Trøndelag Health Study

In this cross-sectional study of adolescents 13–18 years, the prevalence of anxiety and depressive symptoms increased with age in both genders. For boys, the odds ratio (OR) for a high SCL score increased by 1.23 (95% confidence interval (CI): 1.14–1.32, $p < 0.001$) for each additional year in age. For girls, the corresponding number was 1.20 (95% CI: 1.15–1.26, $p < 0.001$).

Adolescent boys without symptoms of anxiety and depression had higher self-esteem and more behaviour problems at school than girls without symptoms. The same pattern of gender differences was found among adolescents who presented symptoms of anxiety and depression. However, in other variables, the pattern of gender differences varied

between those who indicated symptoms of anxiety and depression and those who did not. Gender was a moderator in the well-being and social functioning of adolescents with symptoms of anxiety and depression; the associations between such symptoms and lower subjective well-being and self-esteem, more frequent academic problems and lower frequency of meeting friends were larger among boys than among girls.

6.3 Paper II

Gender differences in psychosocial functioning of adolescents with symptoms of anxiety and depression: longitudinal findings from the Nord-Trøndelag Health Study

Adolescents who indicated symptoms of anxiety and depression at both waves reported lower psychosocial functioning (e.g., more academic and behaviour problems and less frequent meetings with friends) and had lower subjective well-being and self-esteem than their symptom-free peers almost in all the above-mentioned measures. However, the magnitude of impairment and patterns of changes in functioning between the various symptom groups differed between genders. A significant interaction effect of gender and symptoms of anxiety and depression was found in the male group, meaning that the effect of having such symptoms on subjective well-being, self-esteem and psychosocial functioning was stronger in boys than in girls.

Furthermore, it was found that both girls and boys with onset of symptoms at follow-up had more academic problems, lower subjective well-being and lower self-esteem than their peers who reported no symptoms of anxiety and depression in both waves. However, the onset of symptoms associated with less frequent meetings with friends was found only among boys. In addition, boys who had previously reported symptoms, but who no longer suffered from symptoms of anxiety and depression, still had higher rates of academic and behaviour problems and lower subjective well-being and self-esteem than boys who had no symptoms at both measuring points. No such differences were found in the sample of girls.

6.4 Paper III

Adolescent predictors and associates of psychosocial functioning in young men and women: 11 Year Follow-Up Findings from the Nord-Trøndelag Health Study

In this study we found that frequency of meeting friends and subjective well-being seemed to be the strongest adolescent predictors of psychosocial functioning in young adulthood.

Four outcome variables were explored: friends support, cohabitation, community connectedness, and work satisfaction. Friends support in adulthood was predicted by frequency of meeting friends in women, and by subjective well-being in men. Cohabitation was predicted by frequency of meeting friends in both genders.

Community connectedness was predicted by symptoms of anxiety and depression in women, and by subjective well-being in both genders. Work satisfaction was predicted by subjective well-being in women.

7. Discussion

The aim of the present research project was to explore subjective well-being, self-esteem and psychosocial functioning of adolescent boys and girls with symptoms of anxiety and depression, both in a cross-sectional and longitudinal design. In addition, we aimed to investigate whether mental health and psychosocial functioning in adolescence could predict psychosocial functioning in adulthood, and whether these predictors were moderated by gender.

The main findings were that gender was a moderator in the well-being and social functioning of adolescents with symptoms of anxiety and depression. In the cross-sectional study, the associations between such symptoms and lower subjective well-being and self-esteem, more severe academic problems and lower frequency of meeting friends were larger among boys than among girls. The results of the longitudinal study further strengthened and broadened these findings. Previous, current or continuous presentation of symptoms of anxiety and depression impaired boys' functioning to a larger extent than girls' functioning. Onset of symptoms between baseline and follow-up was associated with less frequent meetings with friends among boys, but not among girls. In addition, after remission of symptoms, boys still had more behaviour and academic problems, less frequently met friends and reported lower subjective well-being and self-esteem than boys who had no symptoms at both time points. No similar differences were found among the girls.

The main finding of the third study was that subjective well-being and frequency of meeting friends in adolescence emerged as the most important predictors for adult functioning. Since boys with adolescent symptoms of anxiety and depression were more impaired than the girls regarding the frequency of meeting friends, it may be suggested that their functioning as adults was at a greater risk than the girls.

7.1 Prevalence of anxiety and depression

The prevalence of symptoms of anxiety and depression found in our study is similar to the prevalence which has been reported by many international and Scandinavian studies (Bilenberg, Petersen, Hoerder, & Gillberg, 2005; Costello, et al., 2005; Meltzer, Gatward, Goodman, & Ford, 1999). A previous Norwegian study reported a similar prevalence increase with age (Wichstrom, 1999), and the increase with age among females is well documented (Essau, Lewinsohn, Seeley, & Sasagawa, 2010). We found an increase in depression rates among adolescent boys also, which is in line with some previous research (Cyranowski, et al., 2000; P. M. Lewinsohn, et al., 1998; Wichstrom, 1999). An interesting result is the decrease in symptoms of anxiety and depression in young adulthood, compared to late adolescence, among females. Similar findings were reported among Caucasian girls in an American study, which investigated only females (Franko et al., 2005), and it is consistent with a recent study in which early adulthood was found to be a period of positive growth and reduced symptomatology for most people (Frye & Liem, 2011). However, prevalence rates among males in the transition

from adolescence to adulthood were stable in our research.. A study from New Zealand has found an increase in distress among men aged 20–29 years but not in women (Jorm & Butterworth, 2006). More research is needed in order to decide whether this is an artefact or a real phenomenon.

7.2 Larger impairment in boys with symptoms of anxiety and depression than in girls

7.2.1 Social competence and support

In our longitudinal study of adolescents (paper 2), we found that onset of symptoms between baseline and follow-up was associated with less frequent meetings with friends among boys, but not among girls. Additional analysis revealed that boys who later developed symptoms of anxiety and depression (onset group) did not differ from their symptom-free colleagues (no symptom group) in frequency of meeting friends at baseline. Thus, decrease in frequency of meeting friends did not present a risk for later development of symptoms of anxiety and depression, but such a decrease appeared with or after the development of symptoms.

On the other hand, symptoms of anxiety and depression in baseline predicted lower frequency of meeting friends in boys but not in girls in follow-up. It may be that symptoms of anxiety and depression are followed by more of a decrease in social

contacts and social support in boys than in girls, and that this social loss can partially explain the greater impairment in functioning.

It was further found that the girls with symptoms both at baseline and at follow-up met friends with the same frequency as their symptom-free peers. This was the only domain in which girls with anxiety and depression were not impaired in comparison with symptom-free girls. These findings support the hypothesis that girls with symptoms of anxiety and depression are more successful in maintaining social relations than boys. Only boys reported more behaviour problem at the onset of symptoms, which may further contribute to deterioration in social relations and increase the risk of depression (Capaldi & Stoolmiller, 1999). Some evidence for the hypothesis that boys are at greater risk of losing social support when distressed is found in previous research. Larson et al. (1990) found that social isolation and lack of social support seem to be more strongly associated with symptoms of anxiety and depression in boys than in girls. It might be that boys tend to lose their social support earlier than girls when distressed, and hence become even more isolated and inhibited than girls in distress. This results in a vicious cycle affecting their self-esteem, subjective well-being and functioning at school.

Evidence for the hypothesis that anxiety and depression impairs boys' social relations more strongly than girls' social relations is still scarce. However, an accumulating body of knowledge, together with some theoretical models, are in favour of this hypothesis, as follows.

Previous research reported that social isolation and lack of social support were more strongly associated with symptoms of anxiety and depression among boys in pre- and early adolescence than among girls (Hunter, et al., 2009; Larson, et al., 1990; Troop-Gordon & Ladd, 2005). Furthermore, studies on more severe psychiatric disorders such as psychotic disorders have consistently found that men are more socially isolated than their female counterparts (Scott, 2011).

Girls are usually characterized, from birth and onwards, as having more social sensitivity and greater ability to regulate emotions than boys, and these differences seem to persist across the life span (C. Zahn-Waxler, et al., 2008). This primary advantage is further reinforced by environment. Both fathers and mothers seem to adjust their socialization behaviour to their child's gender; thus, for example, encouraging their daughters to express sadness or fright, while discouraging their sons from doing the same (Chaplin, Cole, & Zahn-Waxler, 2005; Fivush, Brotman, Buckner, & Goodman, 2000; Hastings & De, 2008). Girls report significantly more access to social resources than boys, and they are generally more skilled in using social support and resources, which are protective factors in face of adversities (Hjemdal, Friborg, Stiles, Martinussen, & Rosenvinge, 2006).

Across the entire life cycle, females are more likely to mobilize social support, especially from other females, in times of stress (Vigil, 2009). Adolescent girls report more informal sources of support than do boys, and they are more likely to turn to their same-sex peers for support than boys are (Taylor, et al., 2000). Thus, girls receive more

relationship provisions which may contribute to a positive emotional adjustment (Rose & Rudolph, 2006). However, these provisions may not overpower the other processes that increase the risk of emotional problems in girls, such as concerns about general peer evaluation, exposure to peer stress, and rumination (Rose & Rudolph, 2006; C. Zahn-Waxler, et al., 2008). Hence, it may be useful to differentiate between risk factors for depression and coping strategies in depressed boys and girls. Although girls' social skills expose them to an increased risk of depression (Crick & Zahn-Waxler, 2003), these same skills may also provide them with better competence at seeking help and support when they are in distress and thereby contributes to the maintenance of their level of functioning. This hypothesis is backed by the findings of a recent study which found disproportionately greater role, social and cognitive disability among adult men with emotional disorders than among women (Scott & Collings, 2010). The authors suggest that women experienced less disability due to the greater likelihood that they would seek treatment and the support of stronger social networks.

Some theoretical models can be helpful in understanding these issues. One model suggests that stressed females do not adopt the well reported strategy of 'fight-or-flight' when coping with stress, but rather a strategy which can be described as 'tend-and-befriend'. This strategy involves affiliative activities designed to create and maintain social networks that can help offset stress and promote caring for the community's offspring (Taylor, et al., 2000). A socio-relational perspective of distress behaviours (Vigil, 2009; Vigil, et al., 2010) can explain both the increase in prevalence of symptoms of anxiety and depression during adolescence in females and the decrease of

emotional expression during stress in males. This theory, which is based on an evolutionary model, suggests that gender-specific patterns of emotional expression are strongly connected to the perceived attractiveness of the individual as a prospective social partner or parent. The author claims that in most prehistoric societies, women usually moved to live in their husband's community, and this entitled them to create a social and support network of their own, usually based on a relatively small number of strong social ties. Thus, females may be particularly sensitive to displaying cues of trustworthiness and to making emotional investments in their relationships in comparison to males, because these behaviours were beneficial for maintaining more intimate and exclusive dyadic relationships (Taylor, et al., 2000; Vigil, 2009). Females' vulnerability increases during reproductive maturation and adolescence, and especially in situations of unreliable social support, because these are conditions that can result in sexual exploitation and pregnancy, under which circumstances this support is especially needed. As a result, both increases in feelings of distress and the increased tendency to express them can be perceived as bearing evolutionary advantages for females.

Males, on the other hand, would normally remain in their original community and had less of a need to create social networks than women did. Their status was affected mainly by their ability to provide for their families. Thus, expressing vulnerability may present disadvantages for men and advantages for women, while the ability to express functional capacity may, in some cases, be more advantageous for men than for women (Vigil, 2009; Vigil, et al., 2010).

7.2.2 The meaning of role and functioning for men

The importance of functioning for men can be further clarified by some evidence from research on adult men and functional impairment associated with mental disorders. Scott and Collings (2010) found that men with current mood or anxiety disorders were significantly more likely than women with the same disorders to report disability in role, social functioning, and cognitive functioning. Men did not report more disability in the mobility and self-care domains of functioning nor were there gender differences in any type of disability associated with substance use disorders. The researchers suggested that men are more dependent on work for their self-esteem and sense of efficacy and at the same time are met with greater expectations regarding occupational performance and financial provision for their families. This combination may add to a greater sense of psychological pressure, guilt, or failure among depressed men and may be a contributing factor in the greater degree of role disability that they report (Scott, 2011).

Greater functional impairment among men is further validated by research which found that women had twice the incidence of sickness absence due to psychiatric disorder as men, but men had longer duration of absences in connection with depression, anxiety, and psychotic disorders, although not with substance use disorders (Hensing, Brage, Nygard, Sandanger, & Tellnes, 2000). Furthermore, in our first and second studies, gender was a moderator variable in the associations between symptoms of anxiety and depression and school functioning. In another Norwegian study,

symptoms of anxiety and depression preceded lower academic functioning among boys but not among girls (Sund, et al., 2003). A more substantial body of research on psychotic disorders has found that men have more functional disability and poorer outcomes than their female counterparts (Scott, 2011).

The greater dependence on work for self-esteem and identity, together with less sharing of distress, can explain the relatively lesser use of health services among men (Scott, 2011). This again can increase men's problems to a point where they can no longer function.

7.2.3 The gender paradox of co-morbidities

Lower functioning of boys than of girls with symptoms of anxiety and depression may also be explained by the "gender paradox of co-morbidities"; when a disorder has a gender-related prevalence, it is assumed that the underlying liability is similar for both genders, but that the critical threshold for the presence of disorder varies (Eme, 1992). It can then be predicted that the gender which is characterized by lower prevalence of psychiatric disorder will be more severely affected by this disorder (Eme, 1992). This hypothesis may have possible explanatory value in our study. The prevalence of symptoms of anxiety and depression is lower among boys than among girls, but when boys are affected, their functioning is more severely impaired.

7.3 Adolescent predictors of psychosocial functioning in adulthood

7.3.1 Symptoms of anxiety and depression in adolescence – and adult functioning

Anxiety and depression in adolescence have been found to predict functioning in adulthood in many studies (Burt & Roisman, 2010; Lewinsohn, et al., 2003), but they had a minor effect in our third study. Symptoms of anxiety and depression in adolescence predicted work satisfaction in both genders and community connectedness in women in the separate analyses, but remained a significant predictor in the mutually adjusted analyses only for community connectedness in women. These findings are supported by previous research, showing that the predictive effect of adolescent psychopathology weakens or even disappears when accounting for psychosocial functioning in adolescence (Lewinsohn, et al., 2003).

The influence of adolescent psychopathology on functioning in adulthood may partially be expressed indirectly, through current psychopathology (Lewinsohn, et al., 2003). Additional analyses of our data, which have not been reported in the papers, confirm the importance of current psychopathology on functioning, and reveal similar gender differences to those reported in papers 1 and 2, namely: greater impairment in functioning among men. Since we lack information about duration and onset of psychopathology in the large time lag between our waves, we were not able to explore this issue further. Future research should address the topic of gender differences in the links between adolescent and current psychopathology and current functioning. However, two other adolescent measurements seem to play an important role in

predicting functioning in adulthood – subjective well-being and frequency of meeting friends.

7.3.2 Subjective well-being

Subjective well-being predicted community connectedness in both genders, and work satisfaction in women. It almost reached the significance level as a predictor for men ($p=0.057$). These two outcome variables reflect the adjustment to two main social systems of adult life. Others have reported subjective well-being to be associated with work satisfaction (Bray & Gunnell, 2006). In addition, subjective well-being in adolescence may represent a concise measurement of perceived competence, which has been found to predict work satisfaction in adulthood (Masten, Desjardins, McCormick, Kuo, & Long, 2010).

7.3.3 Frequency of meeting friends

An additional important adolescent predictor was frequency of meeting friends. It predicted cohabitation in both genders, and friends support only in women. It is not surprising that sociability in adolescence will predict aspects of social relations in adulthood. Nevertheless, what is the reason for the reported gender differences?

Currently we are unable to give a full explanation of these results and have not found any previous research which can explain them. It may be suggested that cohabitation requires different qualities than friends support. In addition, our cohabitation measure is based only on one question – “do you live with a spouse”. It does not give us

information on the duration and quality of the relationship, thus this finding is difficult to interpret.

By contrast, friends' support reflects the trust and support a person may experience in a relationship. Based on our discussion in section 8.2, we hypothesize that gender differences in the predictive role of frequency of meeting friends may be due to the stronger effect of current psychopathology on men's social relations. This hypothesis is further supported by the finding that men's friends support was predicted by subjective well-being, which is an indicator of mental health.

7.4 Strengths and Limitations

The main strengths of this research project are the large sample size, being a longitudinal research project in a population based sample, and some methodological advantages which enabled us to detect previously undetected differences. Main weaknesses are the use of self-report questionnaires, the quality of some of the measurements and the large attrition rate in the third study. The strengths and limitations will be further addressed in the discussion below of possible problems in epidemiological studies, namely chance, bias, confounding, and causality.

Chance

The finding of greater Impairment in functioning of boys with symptoms of anxiety and depression than of girls was consistent across domains in the cross-sectional study. Furthermore, this trend was further confirmed in the longitudinal study. Due to the large sample size, we chose to set our significance level at $p < 0.01$ in the first study, and most of the main findings were significant at $p < 0.01$ level also in the other studies. All these indicate that it is unlikely to obtain these results by chance.

Bias

Selection bias

This project is a population-based study, which covers a whole county, with high participation rates in the first and second waves. Thus it significantly reduced the chances of selection bias. However, Nord-Trøndelag County is mainly a rural area, with some small cities, but without large city populations. This may have affected the characteristics of the population and the results. In the last phase of the study we had a high attrition rate. One of the main reasons may be the need of many young people to move to a large city outside the county for higher education and better work opportunities. We checked the sample characteristics thoroughly and found no significant differences between the respondents and non-respondents in adolescent symptoms of anxiety and depression, subjective well-being, and behaviour problems. Thus we believe that the attrition rate had minimal effect on the results.

Systemic bias

Since our sample was not a clinical sample, we had a relatively low number of participants with enduring symptoms of anxiety and depression throughout the whole study period. As a result, we were not able to reach conclusions regarding young adults who presented symptoms both in adolescence and in adulthood.

However, the frequent use of clinical samples in research has been put forward as a possible source for biased conclusions regarding greater impairment among depressed women than among depressed men. Among other factors, treatment seeking is influenced by sex, hence, clinical samples which include only those who seek treatment may lead to bias (Scott, 2011). Our use of a population-based sample enabled us to minimize this systemic error. Furthermore, a number of methodological advantages, which will be further detailed, contributed to overcoming some systemic errors common in studies of gender differences.

Although the role of gender in the development of psychopathology has received much attention in the recent years, only a few studies have focused on differences in the functional manifestation of psychopathology (Crick & Zahn-Waxler, 2003). Studies addressing similar research questions have usually defined symptoms of anxiety and depression as an outcome variable (Lewinsohn, et al., 1994; Takakura & Sakihara, 2001). By contrast, we were interested in the daily functioning of adolescents who presented such symptoms. Therefore, we used symptoms of anxiety and depression to define study groups, and used functioning as the outcome variable. Crick and Zahn-

Waxler (2003) refer to the tendency to include only one gender or to statistically control for gender as factors which contributed to the potential overlook of the role of gender in the development, manifestation and consequences of psychopathology. A failure to examine interactions between gender and other factors is mentioned as one of the deficiencies in gender research. This failure derives from the need to examine main effects prior to interaction effects in many of the common statistical procedures (Crick & Zahn-Waxler, 2003). Our sample size made it possible to find main effects, which then allowed us to investigate interaction effects. Thus, our large sample size and special focus on gender differences might have enabled us to trace differences that were difficult to trace beforehand.

Social desirability and Recall bias

The use of self-report questionnaires in the HUNT study allowed for the investigation of a broad spectrum of phenomena. However, self-report questionnaires may be more prone to bias due to the possible influence of social desirability factors and recall bias which is affected by the current status of the respondent.

Confounders

The confounding effect of age and socio-economic status was controlled for by entering these variables into the various models. Thus, these factors could not explain the results. Another risk of confounding is the large time lag between wave 1 and 3, which may have affected our participants in ways which have not been investigated. The large time lag may explain some of the weak results in paper 3.

Measures

The use of shortened versions of widely used questionnaires, and of variables consisting of only one item may result in a lack of analysis sensitivity. Although these shortened versions demonstrate good validity, they may involve reduced sensitivity, as can result with all such instruments. In addition, using shortened versions or few questions to explore a domain of behaviour may result in only partial exploration of the area investigated. This may be the case when using the SCL 5, and by the use of some of our measurements which consisted of only one item, such as work satisfaction and cohabitation.

In addition, the SCL 5 which measured symptoms of anxiety and depression and had a central role in this project was also a self-report tool which has been validated on Norwegian youth only from the age of 16. Using a diagnostic evaluation of anxiety and depression and combining several information sources, such as parents and teachers reports, might have enhanced the sensitivity and validity of our measurements.

Nonetheless, the compatibility between our findings and previous research corroborates the validity of this tool in general, and also for 13–15 years old participants. The use of more sensitive and comprehensive measurement tools is needed in future research.

7.5 Future research

Future research should account for the limitations of the current study. Investigating both population and clinical samples and using additional measurement tools such as validated detailed measurements and interviews can give more detailed and sensitive results. Obtaining more sensitive data collected from multiple sources will also enable researchers to apply more sophisticated methods of analysis.

Some additional research directions may be suggested. The rapidly growing interest and knowledge of gene-environment interaction may broaden our understanding of the development and course of psychopathology in general, and of gender differences in particular. It is widely accepted that the increased prevalence of depression among girls is strongly associated with pubertal changes (Paus, et al., 2008). Recent studies in brain neuro-imaging suggest that the course of brain development is often as important as its final stage of development, and that gender differences exist in brain development during adolescence (Paus, et al., 2008). Future research should look into the complex interactions between biological, developmental and social factors in adolescence and their possible effect on psychopathology and dysfunction.

Last, rapid changes in the social milieu and ways of social interaction over the past years should be considered. Since Young HUNT 1 was collected in 1995, a whole new domain of social communication through the Internet has emerged. It will be interesting to explore whether the World Wide Web has opened up unique new social opportunities for both genders, and especially for boys with symptoms of anxiety and depression.

8. Conclusion

Previous and ongoing symptoms of anxiety and depression had more negative consequences for boys than for girls. Boys with such symptoms experienced a larger decrease in their subjective well-being, self-esteem and social relations and they had more school problems than girls. The most important adolescent predictors for adult functioning were subjective well-being and frequency of meeting friends.

We can now go back to Anna and Tom, the two 14-year-old adolescents with symptoms of anxiety and depression who were presented in the beginning of this project. Our results indicate that Tom's psychosocial functioning is more likely to be impaired than Anna's functioning. Their social relations and subjective well-being as adolescents are likely to predict their functioning as young adults.

Our results should draw attention to the different, as well as the shared needs of adolescent boys and girls with symptoms of anxiety and depression. An emphasis should be put on functional impairment, both in assessment and as a focus of treatment. This is important for both genders, but may have special significance for boys and men. Improving social competence should be a major aim of intervention, due to its importance as a predictor for future functioning.

9. Summary

In this longitudinal research project we explored psychosocial functioning of adolescents and young adults with and without symptoms of anxiety and depression . The participants were assessed at three time points: 1995–97 - Young HUNT 1 (around 9000 participants) 2000–2001 - Young HUNT 2 (roughly 2500 participants), and 2006 - HUNT 3 (1300 participants).

We found that symptoms of anxiety and depression were more prevalent in girls than in boys. However, previous and ongoing symptoms of anxiety and depression had more negative consequences for boys than for girls. In the cross-sectional study, the associations between such symptoms and lower subjective well-being and self-esteem, more academic problems and lower frequency of meeting friends were greater among boys than among girls. The results of the longitudinal study further strengthened and broadened these findings. Previous, current or continuous presentation of symptoms of anxiety and depression impaired boys' functioning to a larger extent than girls' functioning. Onset of symptoms between baseline and follow-up was associated with less frequent meetings with friends among boys, but not among girls. In addition, after remission of symptoms, boys still had more behaviour and academic problems, less frequently met friends and reported lower subjective well-being and self-esteem than boys who had no symptoms at both time points. No similar differences were found among the girls.

Subjective well-being and frequency of meeting friends in adolescence emerged as the most important predictors for adult functioning. Adolescent subjective well-being predicted friends support in men, work satisfaction in women and community connectedness in both genders. Frequency of meeting friends in adolescence predicted friends support in adult women and cohabitation in both genders. These results should draw attention to functional impairment associated with symptoms of anxiety and depression in men and women, both in assessment and as a focus of treatment.

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69. Kjetil B. Åsbakk: STUDIES OF A PROTEIN FROM PSORIATIC SCALE, PSO P27, WITH RESPECT TO ITS POTENTIAL ROLE IN IMMUNE REACTIONS IN PSORIASIS.
70. Arnulf Hestnes: STUDIES ON DOWN'S SYNDROME.
71. Randi Nygaard: LONG-TERM SURVIVAL IN CHILDHOOD LEUKEMIA.
72. Bjørn Hagen: THIO-TEPA.
73. Svein Anda: EVALUATION OF THE HIP JOINT BY COMPUTED TOMOGRAPHY AND ULTRASONOGRAPHY.

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74. Martin Svartberg: AN INVESTIGATION OF PROCESS AND OUTCOME OF SHORT-TERM PSYCHODYNAMIC PSYCHOTHERAPY.
75. Stig Arild Slørdahl: AORTIC REGURGITATION.
76. Harold C Sexton: STUDIES RELATING TO THE TREATMENT OF SYMPTOMATIC NON-PSYCHOTIC PATIENTS.
77. Maurice B. Vincent: VASOACTIVE PEPTIDES IN THE OCULAR/FOREHEAD AREA.
78. Terje Johannessen: CONTROLLED TRIALS IN SINGLE SUBJECTS.
79. Turid Nilsen: PYROPHOSPHATE IN HEPATOCYTE IRON METABOLISM.
80. Olav Haraldseth: NMR SPECTROSCOPY OF CEREBRAL ISCHEMIA AND REPERFUSION IN RAT.
81. Eiliv Brenna: REGULATION OF FUNCTION AND GROWTH OF THE OXYNTIC MUCOSA.

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82. Gunnar Bovim: CERVICOGENIC HEADACHE.
83. Jarl Arne Kahn: ASSISTED PROCREATION.
84. Bjørn Naume: IMMUNOREGULATORY EFFECTS OF CYTOKINES ON NK CELLS.
85. Rune Wiseth: AORTIC VALVE REPLACEMENT.
86. Jie Ming Shen: BLOOD FLOW VELOCITY AND RESPIRATORY STUDIES.
87. Piotr Kruszewski: SUNCT SYNDROME WITH SPECIAL REFERENCE TO THE AUTONOMIC NERVOUS SYSTEM.
88. Mette Haase Moen: ENDOMETRIOSIS.
89. Anne Vik: VASCULAR GAS EMBOLISM DURING AIR INFUSION AND AFTER DECOMPRESSION IN PIGS.
90. Lars Jacob Stovner: THE CHIARI TYPE I MALFORMATION.
91. Kjell Å. Salvesen: ROUTINE ULTRASONOGRAPHY IN UTERO AND DEVELOPMENT IN CHILDHOOD.

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92. Nina-Beate Liabakk: DEVELOPMENT OF IMMUNOASSAYS FOR TNF AND ITS SOLUBLE RECEPTORS.
93. Sverre Helge Torp: *erbB* ONCOGENES IN HUMAN GLIOMAS AND MENINGIOMAS.
94. Olav M. Linaker: MENTAL RETARDATION AND PSYCHIATRY. Past and present.
95. Per Oscar Feet: INCREASED ANTIDEPRESSANT AND ANTIPANIC EFFECT IN COMBINED TREATMENT WITH DIXYRAZINE AND TRICYCLIC ANTIDEPRESSANTS.
96. Stein Olav Samstad: CROSS SECTIONAL FLOW VELOCITY PROFILES FROM TWO-DIMENSIONAL DOPPLER ULTRASOUND: Studies on early mitral blood flow.
97. Bjørn Backe: STUDIES IN ANTENATAL CARE.
98. Gerd Inger Ringdal: QUALITY OF LIFE IN CANCER PATIENTS.
99. Torvid Kiserud: THE DUCTUS VENOSUS IN THE HUMAN FETUS.
100. Hans E. Fjøsne: HORMONAL REGULATION OF PROSTATIC METABOLISM.
101. Eylert Brodtkorb: CLINICAL ASPECTS OF EPILEPSY IN THE MENTALLY RETARDED.
102. Roar Juul: PEPTIDERGIC MECHANISMS IN HUMAN SUBARACHNOID HEMORRHAGE.
103. Unni Syversen: CHROMOGRANIN A. Physiological and Clinical Role.

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104. Odd Gunnar Brakstad: THERMOSTABLE NUCLEASE AND THE *nuc* GENE IN THE DIAGNOSIS OF *Staphylococcus aureus* INFECTIONS.
105. Terje Engan: NUCLEAR MAGNETIC RESONANCE (NMR) SPECTROSCOPY OF PLASMA IN MALIGNANT DISEASE.
106. Kirsten Rasmussen: VIOLENCE IN THE MENTALLY DISORDERED.
107. Finn Egil Skjeldestad: INDUCED ABORTION: Timetrends and Determinants.
108. Roar Stenseth: THORACIC EPIDURAL ANALGESIA IN AORTOCORONARY BYPASS SURGERY.
109. Arild Faxvaag: STUDIES OF IMMUNE CELL FUNCTION *in mice infected with* MURINE RETROVIRUS.

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110. Svend Aakhus: NONINVASIVE COMPUTERIZED ASSESSMENT OF LEFT VENTRICULAR FUNCTION AND SYSTEMIC ARTERIAL PROPERTIES. Methodology and some clinical applications.
111. Klaus-Dieter Bolz: INTRAVASCULAR ULTRASONOGRAPHY.
112. Petter Aadahl: CARDIOVASCULAR EFFECTS OF THORACIC AORTIC CROSS-CLAMPING.
113. Sigurd Steinshamn: CYTOKINE MEDIATORS DURING GRANULOCYTOPENIC INFECTIONS.
114. Hans Stifoss-Hanssen: SEEKING MEANING OR HAPPINESS?
115. Anne Kvikstad: LIFE CHANGE EVENTS AND MARITAL STATUS IN RELATION TO RISK AND PROGNOSIS OF CANCER.
116. Torbjørn Grøntvedt: TREATMENT OF ACUTE AND CHRONIC ANTERIOR CRUCIATE LIGAMENT INJURIES. A clinical and biomechanical study.
117. Sigrid Hørven Wigert: CLINICAL STUDIES OF FIBROMYALGIA WITH FOCUS ON ETIOLOGY, TREATMENT AND OUTCOME.
118. Jan Schjøtt: MYOCARDIAL PROTECTION: Functional and Metabolic Characteristics of Two Endogenous Protective Principles.
119. Marit Martinussen: STUDIES OF INTESTINAL BLOOD FLOW AND ITS RELATION TO TRANSITIONAL CIRCULATORY ADAPATION IN NEWBORN INFANTS.
120. Tomm B. Müller: MAGNETIC RESONANCE IMAGING IN FOCAL CEREBRAL ISCHEMIA.
121. Rune Haaverstad: OEDEMA FORMATION OF THE LOWER EXTREMITIES.
122. Magne Børset: THE ROLE OF CYTOKINES IN MULTIPLE MYELOMA, WITH SPECIAL REFERENCE TO HEPATOCYTE GROWTH FACTOR.
123. Geir Smedslund: A THEORETICAL AND EMPIRICAL INVESTIGATION OF SMOKING, STRESS AND DISEASE: RESULTS FROM A POPULATION SURVEY.

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124. Torstein Vik: GROWTH, MORBIDITY, AND PSYCHOMOTOR DEVELOPMENT IN INFANTS WHO WERE GROWTH RETARDED *IN UTERO*.
125. Siri Forsmo: ASPECTS AND CONSEQUENCES OF OPPORTUNISTIC SCREENING FOR CERVICAL CANCER. Results based on data from three Norwegian counties.
126. Jon S. Skranes: CEREBRAL MRI AND NEURODEVELOPMENTAL OUTCOME IN VERY LOW BIRTH WEIGHT (VLBW) CHILDREN. A follow-up study of a geographically based year cohort of VLBW children at ages one and six years.
127. Knut Bjørnstad: COMPUTERIZED ECHOCARDIOGRAPHY FOR EVALUATION OF CORONARY ARTERY DISEASE.
128. Grethe Elisabeth Borchgrevink: DIAGNOSIS AND TREATMENT OF WHIPLASH/NECK SPRAIN INJURIES CAUSED BY CAR ACCIDENTS.
129. Tor Elsås: NEUROPEPTIDES AND NITRIC OXIDE SYNTHASE IN OCULAR AUTONOMIC AND SENSORY NERVES.
130. Rolf W. Gråwe: EPIDEMIOLOGICAL AND NEUROPSYCHOLOGICAL PERSPECTIVES ON SCHIZOPHRENIA.
131. Tonje Strømholm: CEREBRAL HAEMODYNAMICS DURING THORACIC AORTIC CROSSCLAMPING. An experimental study in pigs

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132. Martinus Bråten: STUDIES ON SOME PROBLEMS RELATED TO INTRAMEDULLARY NAILING OF FEMORAL FRACTURES.
133. Ståle Nordgård: PROLIFERATIVE ACTIVITY AND DNA CONTENT AS PROGNOSTIC INDICATORS IN ADENOID CYSTIC CARCINOMA OF THE HEAD AND NECK.

- 134. Egil Lien: SOLUBLE RECEPTORS FOR **TNF** AND **LPS**: RELEASE PATTERN AND POSSIBLE SIGNIFICANCE IN DISEASE.
- 135. Marit Bjørgaas: HYPOGLYCAEMIA IN CHILDREN WITH DIABETES MELLITUS
- 136. Frank Skorpen: GENETIC AND FUNCTIONAL ANALYSES OF DNA REPAIR IN HUMAN CELLS.
- 137. Juan A. Pareja: SUNCT SYNDROME. ON THE CLINICAL PICTURE. ITS DISTINCTION FROM OTHER, SIMILAR HEADACHES.
- 138. Anders Angelsen: NEUROENDOCRINE CELLS IN HUMAN PROSTATIC CARCINOMAS AND THE PROSTATIC COMPLEX OF RAT, GUINEA PIG, CAT AND DOG.
- 139. Fabio Antonaci: CHRONIC PAROXYSMAL HEMICRANIA AND HEMICRANIA CONTINUA: TWO DIFFERENT ENTITIES?
- 140. Sven M. Carlsen: ENDOCRINE AND METABOLIC EFFECTS OF METFORMIN WITH SPECIAL EMPHASIS ON CARDIOVASCULAR RISK FACTORES.

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- 141. Terje A. Murberg: DEPRESSIVE SYMPTOMS AND COPING AMONG PATIENTS WITH CONGESTIVE HEART FAILURE.
- 142. Harm-Gerd Karl Blaas: THE EMBRYONIC EXAMINATION. Ultrasound studies on the development of the human embryo.
- 143. Noëmi Becser Andersen: THE CEPHALIC SENSORY NERVES IN UNILATERAL HEADACHES. Anatomical background and neurophysiological evaluation.
- 144. Eli-Janne Fiskerstrand: LASER TREATMENT OF PORT WINE STAINS. A study of the efficacy and limitations of the pulsed dye laser. Clinical and morfolological analyses aimed at improving the therapeutic outcome.
- 145. Bård Kulseng: A STUDY OF ALGINATE CAPSULE PROPERTIES AND CYTOKINES IN RELATION TO INSULIN DEPENDENT DIABETES MELLITUS.
- 146. Terje Haug: STRUCTURE AND REGULATION OF THE HUMAN UNG GENE ENCODING URACIL-DNA GLYCOSYLASE.
- 147. Heidi Brurok: MANGANESE AND THE HEART. A Magic Metal with Diagnostic and Therapeutic Possibilities.
- 148. Agnes Kathrine Lie: DIAGNOSIS AND PREVALENCE OF HUMAN PAPILLOMAVIRUS INFECTION IN CERVICAL INTRAEPITELIAL NEOPLASIA. Relationship to Cell Cycle Regulatory Proteins and HLA DQBI Genes.
- 149. Ronald Mårvik: PHARMACOLOGICAL, PHYSIOLOGICAL AND PATHOPHYSIOLOGICAL STUDIES ON ISOLATED STOMACHS.
- 150. Ketil Jarl Holen: THE ROLE OF ULTRASONOGRAPHY IN THE DIAGNOSIS AND TREATMENT OF HIP DYSPLASIA IN NEWBORNS.
- 151. Irene Hetlevik: THE ROLE OF CLINICAL GUIDELINES IN CARDIOVASCULAR RISK INTERVENTION IN GENERAL PRACTICE.
- 152. Katarina Tunòn: ULTRASOUND AND PREDICTION OF GESTATIONAL AGE.
- 153. Johannes Soma: INTERACTION BETWEEN THE LEFT VENTRICLE AND THE SYSTEMIC ARTERIES.
- 154. Arild Aamodt: DEVELOPMENT AND PRE-CLINICAL EVALUATION OF A CUSTOM-MADE FEMORAL STEM.
- 155. Agnar Tegnander: DIAGNOSIS AND FOLLOW-UP OF CHILDREN WITH SUSPECTED OR KNOWN HIP DYSPLASIA.
- 156. Bent Indredavik: STROKE UNIT TREATMENT: SHORT AND LONG-TERM EFFECTS
- 157. Jolanta Vanagaite Vingen: PHOTOPHOBIA AND PHONOPHOBIA IN PRIMARY HEADACHES

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- 158. Ola Dalsegg Sæther: PATHOPHYSIOLOGY DURING PROXIMAL AORTIC CROSS-CLAMPING CLINICAL AND EXPERIMENTAL STUDIES
- 159. xxxxxxxx (blind number)
- 160. Christina Vogt Isaksen: PRENATAL ULTRASOUND AND POSTMORTEM FINDINGS – A TEN YEAR CORRELATIVE STUDY OF FETUSES AND INFANTS WITH DEVELOPMENTAL ANOMALIES.
- 161. Holger Seidel: HIGH-DOSE METHOTREXATE THERAPY IN CHILDREN WITH ACUTE LYMPHOCYTIC LEUKEMIA: DOSE, CONCENTRATION, AND EFFECT CONSIDERATIONS.
- 162. Stein Hallan: IMPLEMENTATION OF MODERN MEDICAL DECISION ANALYSIS INTO CLINICAL DIAGNOSIS AND TREATMENT.

163. Malcolm Sue-Chu: INVASIVE AND NON-INVASIVE STUDIES IN CROSS-COUNTRY SKIERS WITH ASTHMA-LIKE SYMPTOMS.
164. Ole-Lars Brekke: EFFECTS OF ANTIOXIDANTS AND FATTY ACIDS ON TUMOR NECROSIS FACTOR-INDUCED CYTOTOXICITY.
165. Jan Lundbom: AORTOCORONARY BYPASS SURGERY: CLINICAL ASPECTS, COST CONSIDERATIONS AND WORKING ABILITY.
166. John-Anker Zwart: LUMBAR NERVE ROOT COMPRESSION, BIOCHEMICAL AND NEUROPHYSIOLOGICAL ASPECTS.
167. Geir Falck: HYPEROSMOLALITY AND THE HEART.
168. Eirik Skogvoll: CARDIAC ARREST Incidence, Intervention and Outcome.
169. Dalius Bansevicius: SHOULDER-NECK REGION IN CERTAIN HEADACHES AND CHRONIC PAIN SYNDROMES.
170. Bettina Kinge: REFRACTIVE ERRORS AND BIOMETRIC CHANGES AMONG UNIVERSITY STUDENTS IN NORWAY.
171. Gunnar Qvigstad: CONSEQUENCES OF HYPERGASTRINEMIA IN MAN
172. Hanne Ellekjær: EPIDEMIOLOGICAL STUDIES OF STROKE IN A NORWEGIAN POPULATION. INCIDENCE, RISK FACTORS AND PROGNOSIS
173. Hilde Grimstad: VIOLENCE AGAINST WOMEN AND PREGNANCY OUTCOME.
174. Astrid Hjelde: SURFACE TENSION AND COMPLEMENT ACTIVATION: Factors influencing bubble formation and bubble effects after decompression.
175. Kjell A. Kvistad: MR IN BREAST CANCER – A CLINICAL STUDY.
176. Ivar Rossvoll: ELECTIVE ORTHOPAEDIC SURGERY IN A DEFINED POPULATION. Studies on demand, waiting time for treatment and incapacity for work.
177. Carina Seidel: PROGNOSTIC VALUE AND BIOLOGICAL EFFECTS OF HEPATOCYTE GROWTH FACTOR AND SYNDECAN-1 IN MULTIPLE MYELOMA.

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178. Alexander Wahba: THE INFLUENCE OF CARDIOPULMONARY BYPASS ON PLATELET FUNCTION AND BLOOD COAGULATION – DETERMINANTS AND CLINICAL CONSEQUENCES
179. Marcus Schmitt-Egenolf: THE RELEVANCE OF THE MAJOR HISTOCOMPATIBILITY COMPLEX FOR THE GENETICS OF PSORIASIS
180. Odrun Arna Gederaas: BIOLOGICAL MECHANISMS INVOLVED IN 5-AMINOLEVULINIC ACID BASED PHOTODYNAMIC THERAPY
181. Pål Richard Romundstad: CANCER INCIDENCE AMONG NORWEGIAN ALUMINIUM WORKERS
182. Henrik Hjørth-Hansen: NOVEL CYTOKINES IN GROWTH CONTROL AND BONE DISEASE OF MULTIPLE MYELOMA
183. Gunnar Morken: SEASONAL VARIATION OF HUMAN MOOD AND BEHAVIOUR
184. Bjørn Olav Haugen: MEASUREMENT OF CARDIAC OUTPUT AND STUDIES OF VELOCITY PROFILES IN AORTIC AND MITRAL FLOW USING TWO- AND THREE-DIMENSIONAL COLOUR FLOW IMAGING
185. Geir Bråthen: THE CLASSIFICATION AND CLINICAL DIAGNOSIS OF ALCOHOL-RELATED SEIZURES
186. Knut Ivar Aasarød: RENAL INVOLVEMENT IN INFLAMMATORY RHEUMATIC DISEASE. A Study of Renal Disease in Wegener's Granulomatosis and in Primary Sjögren's Syndrome
187. Trude Helen Flo: RESEPTORS INVOLVED IN CELL ACTIVATION BY DEFINED URONIC ACID POLYMERS AND BACTERIAL COMPONENTS
188. Bodil Kavli: HUMAN URACIL-DNA GLYCOSYLASES FROM THE UNG GENE: STRUCTURAL BASIS FOR SUBSTRATE SPECIFICITY AND REPAIR
189. Liv Thommesen: MOLECULAR MECHANISMS INVOLVED IN TNF- AND GASTRIN-MEDIATED GENE REGULATION
190. Turid Lingaas Holmen: SMOKING AND HEALTH IN ADOLESCENCE; THE NORD-TRØNDELAG HEALTH STUDY, 1995-97
191. Øyvind Hjertner: MULTIPLE MYELOMA: INTERACTIONS BETWEEN MALIGNANT PLASMA CELLS AND THE BONE MICROENVIRONMENT
192. Ashbjørn Støylen: STRAIN RATE IMAGING OF THE LEFT VENTRICLE BY ULTRASOUND. FEASIBILITY, CLINICAL VALIDATION AND PHYSIOLOGICAL ASPECTS

193. Kristian Midthjell: DIABETES IN ADULTS IN NORD-TRØNDELAG. PUBLIC HEALTH ASPECTS OF DIABETES MELLITUS IN A LARGE, NON-SELECTED NORWEGIAN POPULATION.
194. Guanglin Cui: FUNCTIONAL ASPECTS OF THE ECL CELL IN RODENTS
195. Ulrik Wisløff: CARDIAC EFFECTS OF AEROBIC ENDURANCE TRAINING: HYPERTROPHY, CONTRACTILITY AND CALCIUM HANDLING IN NORMAL AND FAILING HEART
196. Øyvind Halaas: MECHANISMS OF IMMUNOMODULATION AND CELL-MEDIATED CYTOTOXICITY INDUCED BY BACTERIAL PRODUCTS
197. Tore Amundsen: PERFUSION MR IMAGING IN THE DIAGNOSIS OF PULMONARY EMBOLISM
198. Nanna Kurtze: THE SIGNIFICANCE OF ANXIETY AND DEPRESSION IN FATIGUE AND PATTERNS OF PAIN AMONG INDIVIDUALS DIAGNOSED WITH FIBROMYALGIA: RELATIONS WITH QUALITY OF LIFE, FUNCTIONAL DISABILITY, LIFESTYLE, EMPLOYMENT STATUS, CO-MORBIDITY AND GENDER
199. Tom Ivar Lund Nilsen: PROSPECTIVE STUDIES OF CANCER RISK IN NORD-TRØNDELAG: THE HUNT STUDY. Associations with anthropometric, socioeconomic, and lifestyle risk factors
200. Asta Kristine Håberg: A NEW APPROACH TO THE STUDY OF MIDDLE CEREBRAL ARTERY OCCLUSION IN THE RAT USING MAGNETIC RESONANCE TECHNIQUES
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201. Knut Jørgen Arntzen: PREGNANCY AND CYTOKINES
202. Henrik Døllner: INFLAMMATORY MEDIATORS IN PERINATAL INFECTIONS
203. Asta Bye: LOW FAT, LOW LACTOSE DIET USED AS PROPHYLACTIC TREATMENT OF ACUTE INTESTINAL REACTIONS DURING PELVIC RADIOTHERAPY. A PROSPECTIVE RANDOMISED STUDY.
204. Sylvester Moyo: STUDIES ON STREPTOCOCCUS AGALACTIAE (GROUP B STREPTOCOCCUS) SURFACE-ANCHORED MARKERS WITH EMPHASIS ON STRAINS AND HUMAN SERA FROM ZIMBABWE.
205. Knut Hagen: HEAD-HUNT: THE EPIDEMIOLOGY OF HEADACHE IN NORD-TRØNDELAG
206. Li Lixin: ON THE REGULATION AND ROLE OF UNCOUPLING PROTEIN-2 IN INSULIN PRODUCING β -CELLS
207. Anne Hildur Henriksen: SYMPTOMS OF ALLERGY AND ASTHMA VERSUS MARKERS OF LOWER AIRWAY INFLAMMATION AMONG ADOLESCENTS
208. Egil Andreas Fors: NON-MALIGNANT PAIN IN RELATION TO PSYCHOLOGICAL AND ENVIRONMENTAL FACTORS. EXPERIMENTAL AND CLINICAL STUDIES OF PAIN WITH FOCUS ON FIBROMYALGIA
209. Pål Klepstad: MORPHINE FOR CANCER PAIN
210. Ingunn Bakke: MECHANISMS AND CONSEQUENCES OF PEROXISOME PROLIFERATOR-INDUCED HYPERFUNCTION OF THE RAT GASTRIN PRODUCING CELL
211. Ingrid Susann Gribbestad: MAGNETIC RESONANCE IMAGING AND SPECTROSCOPY OF BREAST CANCER
212. Rønnaug Astri Ødegård: PREECLAMPSIA – MATERNAL RISK FACTORS AND FETAL GROWTH
213. Johan Haux: STUDIES ON CYTOTOXICITY INDUCED BY HUMAN NATURAL KILLER CELLS AND DIGITOXIN
214. Turid Suzanne Berg-Nielsen: PARENTING PRACTICES AND MENTALLY DISORDERED ADOLESCENTS
215. Astrid Rydning: BLOOD FLOW AS A PROTECTIVE FACTOR FOR THE STOMACH MUCOSA. AN EXPERIMENTAL STUDY ON THE ROLE OF MAST CELLS AND SENSORY AFFERENT NEURONS
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216. Jan Pål Loennechen: HEART FAILURE AFTER MYOCARDIAL INFARCTION. Regional Differences, Myocyte Function, Gene Expression, and Response to Cariporide, Losartan, and Exercise Training.
217. Elisabeth Qvigstad: EFFECTS OF FATTY ACIDS AND OVER-STIMULATION ON INSULIN SECRETION IN MAN

218. Arne Åsberg: EPIDEMIOLOGICAL STUDIES IN HEREDITARY HEMOCHROMATOSIS: PREVALENCE, MORBIDITY AND BENEFIT OF SCREENING.
219. Johan Fredrik Skomsvoll: REPRODUCTIVE OUTCOME IN WOMEN WITH RHEUMATIC DISEASE. A population registry based study of the effects of inflammatory rheumatic disease and connective tissue disease on reproductive outcome in Norwegian women in 1967-1995.
220. Siv Mørkved: URINARY INCONTINENCE DURING PREGNANCY AND AFTER DELIVERY: EFFECT OF PELVIC FLOOR MUSCLE TRAINING IN PREVENTION AND TREATMENT
221. Marit S. Jordhøy: THE IMPACT OF COMPREHENSIVE PALLIATIVE CARE
222. Tom Christian Martinsen: HYPERGASTRINEMIA AND HYPOACIDITY IN RODENTS – CAUSES AND CONSEQUENCES
223. Solveig Tingulstad: CENTRALIZATION OF PRIMARY SURGERY FOR OVARIAN CANCER. FEASIBILITY AND IMPACT ON SURVIVAL
224. Haytham Eloqayli: METABOLIC CHANGES IN THE BRAIN CAUSED BY EPILEPTIC SEIZURES
225. Torunn Bruland: STUDIES OF EARLY RETROVIRUS-HOST INTERACTIONS – VIRAL DETERMINANTS FOR PATHOGENESIS AND THE INFLUENCE OF SEX ON THE SUSCEPTIBILITY TO FRIEND MURINE LEUKAEMIA VIRUS INFECTION
226. Torstein Hole: DOPPLER ECHOCARDIOGRAPHIC EVALUATION OF LEFT VENTRICULAR FUNCTION IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION
227. Vibeke Nossum: THE EFFECT OF VASCULAR BUBBLES ON ENDOTHELIAL FUNCTION
228. Sigurd Fasting: ROUTINE BASED RECORDING OF ADVERSE EVENTS DURING ANAESTHESIA – APPLICATION IN QUALITY IMPROVEMENT AND SAFETY
229. Solfrid Romundstad: EPIDEMIOLOGICAL STUDIES OF MICROALBUMINURIA. THE NORD-TRØNDELAGE HEALTH STUDY 1995-97 (HUNT 2)
230. Geir Torheim: PROCESSING OF DYNAMIC DATA SETS IN MAGNETIC RESONANCE IMAGING
231. Catrine Ahlén: SKIN INFECTIONS IN OCCUPATIONAL SATURATION DIVERS IN THE NORTH SEA AND THE IMPACT OF THE ENVIRONMENT
232. Arnulf Langhammer: RESPIRATORY SYMPTOMS, LUNG FUNCTION AND BONE MINERAL DENSITY IN A COMPREHENSIVE POPULATION SURVEY. THE NORD-TRØNDELAGE HEALTH STUDY 1995-97. THE BRONCHIAL OBSTRUCTION IN NORD-TRØNDELAGE STUDY
233. Einar Kjelsås: EATING DISORDERS AND PHYSICAL ACTIVITY IN NON-CLINICAL SAMPLES
234. Arne Wibe: RECTAL CANCER TREATMENT IN NORWAY – STANDARDISATION OF SURGERY AND QUALITY ASSURANCE

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235. Eivind Witsø: BONE GRAFT AS AN ANTIBIOTIC CARRIER
236. Anne Mari Sund: DEVELOPMENT OF DEPRESSIVE SYMPTOMS IN EARLY ADOLESCENCE
237. Hallvard Lærum: EVALUATION OF ELECTRONIC MEDICAL RECORDS – A CLINICAL TASK PERSPECTIVE
238. Gustav Mikkelsen: ACCESSIBILITY OF INFORMATION IN ELECTRONIC PATIENT RECORDS; AN EVALUATION OF THE ROLE OF DATA QUALITY
239. Steinar Krokstad: SOCIOECONOMIC INEQUALITIES IN HEALTH AND DISABILITY. SOCIAL EPIDEMIOLOGY IN THE NORD-TRØNDELAGE HEALTH STUDY (HUNT), NORWAY
240. Arne Kristian Myhre: NORMAL VARIATION IN ANOGENITAL ANATOMY AND MICROBIOLOGY IN NON-ABUSED PRESCHOOL CHILDREN
241. Ingunn Dybedal: NEGATIVE REGULATORS OF HEMATOPOIETIC STEM AND PROGENITOR CELLS
242. Beate Sitter: TISSUE CHARACTERIZATION BY HIGH RESOLUTION MAGIC ANGLE SPINNING MR SPECTROSCOPY
243. Per Arne Aas: MACROMOLECULAR MAINTENANCE IN HUMAN CELLS – REPAIR OF URACIL IN DNA AND METHYLATIONS IN DNA AND RNA
244. Anna Bofin: FINE NEEDLE ASPIRATION CYTOLOGY IN THE PRIMARY INVESTIGATION OF BREAST TUMOURS AND IN THE DETERMINATION OF TREATMENT STRATEGIES

245. Jim Aage Nøttestad: DEINSTITUTIONALIZATION AND MENTAL HEALTH CHANGES AMONG PEOPLE WITH MENTAL RETARDATION
246. Reidar Fossmark: GASTRIC CANCER IN JAPANESE COTTON RATS
247. Wibeke Nordhøy: MANGANESE AND THE HEART, INTRACELLULAR MR RELAXATION AND WATER EXCHANGE ACROSS THE CARDIAC CELL MEMBRANE

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248. Sturla Molden: QUANTITATIVE ANALYSES OF SINGLE UNITS RECORDED FROM THE HIPPOCAMPUS AND ENTORHINAL CORTEX OF BEHAVING RATS
249. Wenche Brenne Drøyvold: EPIDEMIOLOGICAL STUDIES ON WEIGHT CHANGE AND HEALTH IN A LARGE POPULATION. THE NORD-TRØNDELAG HEALTH STUDY (HUNT)
250. Ragnhild Støen: ENDOTHELIUM-DEPENDENT VASODILATION IN THE FEMORAL ARTERY OF DEVELOPING PIGLETS
251. Aslak Steinsbekk: HOMEOPATHY IN THE PREVENTION OF UPPER RESPIRATORY TRACT INFECTIONS IN CHILDREN
252. Hill-Aina Steffenach: MEMORY IN HIPPOCAMPAL AND CORTICO-HIPPOCAMPAL CIRCUITS
253. Eystein Stordal: ASPECTS OF THE EPIDEMIOLOGY OF DEPRESSIONS BASED ON SELF-RATING IN A LARGE GENERAL HEALTH STUDY (THE HUNT-2 STUDY)
254. Viggo Pettersen: FROM MUSCLES TO SINGING: THE ACTIVITY OF ACCESSORY BREATHING MUSCLES AND THORAX MOVEMENT IN CLASSICAL SINGING
255. Marianne Fyhn: SPATIAL MAPS IN THE HIPPOCAMPUS AND ENTORHINAL CORTEX
256. Robert Valderhaug: OBSESSIVE-COMPULSIVE DISORDER AMONG CHILDREN AND ADOLESCENTS: CHARACTERISTICS AND PSYCHOLOGICAL MANAGEMENT OF PATIENTS IN OUTPATIENT PSYCHIATRIC CLINICS
257. Erik Skaasheim Haug: INFRARENAL ABDOMINAL AORTIC ANEURYSMS – COMORBIDITY AND RESULTS FOLLOWING OPEN SURGERY
258. Daniel Kondziella: GLIAL-NEURONAL INTERACTIONS IN EXPERIMENTAL BRAIN DISORDERS
259. Vegard Heimly Brun: ROUTES TO SPATIAL MEMORY IN HIPPOCAMPAL PLACE CELLS
260. Kenneth McMillan: PHYSIOLOGICAL ASSESSMENT AND TRAINING OF ENDURANCE AND STRENGTH IN PROFESSIONAL YOUTH SOCCER PLAYERS
261. Marit Sæbø Indredavik: MENTAL HEALTH AND CEREBRAL MAGNETIC RESONANCE IMAGING IN ADOLESCENTS WITH LOW BIRTH WEIGHT
262. Ole Johan Kemi: ON THE CELLULAR BASIS OF AEROBIC FITNESS, INTENSITY-DEPENDENCE AND TIME-COURSE OF CARDIOMYOCYTE AND ENDOTHELIAL ADAPTATIONS TO EXERCISE TRAINING
263. Eszter Vanky: POLYCYSTIC OVARY SYNDROME – METFORMIN TREATMENT IN PREGNANCY
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