



JUHA-MATTI VÄÄNÄNEN

Social Phobia and Depression in
Adolescence in General Population

Concurrent associations
and 2 year follow up



ACADEMIC DISSERTATION

To be presented, with the permission of
the Board of the School of Medicine of the University of Tampere,
for public discussion in the Small Auditorium of Building B,
School of Medicine of the University of Tampere,
Medisiinarinkatu 3, Tampere, on April 17th, 2015, at 12 o'clock.

UNIVERSITY OF TAMPERE

JUHA-MATTI VÄÄNÄNEN

Social Phobia and Depression in
Adolescence in General Population

Concurrent associations
and 2 year follow up

Acta Universitatis Tamperensis 2040
Tampere University Press
Tampere 2015



UNIVERSITY
OF TAMPERE

ACADEMIC DISSERTATION

University of Tampere, School of Medicine

Tampere University Hospital, Department of Adolescent Psychiatry

Finland

Supervised by

Professor Riittakerttu Kaltiala-Heino

University of Tampere

Finland

Professor Mauri Marttunen

University of Helsinki

Finland

Reviewed by

Professor Pirjo Mäki

University of Oulu

Finland

Docent Jani Penttilä

University of Tampere

Finland

The originality of this thesis has been checked using the Turnitin OriginalityCheck service in accordance with the quality management system of the University of Tampere.

Copyright ©2015 Tampere University Press and the author

Cover design by

Mikko Reinikka

Distributor:

kirjamyynnti@juvenes.fi

<http://granum.uta.fi>

Acta Universitatis Tamperensis 2040

ISBN 978-951-44-9760-5 (print)

ISSN-L 1455-1616

ISSN 1455-1616

Acta Electronica Universitatis Tamperensis 1529

ISBN 978-951-44-9761-2 (pdf)

ISSN 1456-954X

<http://tampub.uta.fi>

Suomen Yliopistopaino Oy – Juvenes Print
Tampere 2015



To Maria, Mikael and Emil

Contents

List of original publications	11
Abbreviations	12
Abstract.....	14
Tiivistelmä	16
1 Introduction	18
2 Review of the literature	21
2.1 Development in adolescence	21
2.1.1 Development of identity	21
2.1.2 Development of the brain.....	22
2.1.3 Cognitive development.....	23
2.1.4 Developmental epidemiology and developmental psychopathology.....	25
2.2 Psychiatric disorders in adolescence	32
2.2.1 Social phobia	33
2.2.2 Depression.....	35
2.3 Comorbidity and continuity of adolescent psychiatric disorders	37
2.4 Concurrent and longitudinal associations between social phobia and depression	39

2.4.1	Comorbidity between social phobia and depression	39
2.4.2	Development of comorbidity between social phobia and depression.....	40
2.4.3	Consequences of comorbidity between social phobia and depression.....	40
2.4.4	Theories on the development of comorbidity between social phobia and depression.....	42
2.5	Risk factors for adolescent psychiatric disorders	43
2.5.1	Risk factors for social phobia	44
2.5.2	Risk factors for depression	45
2.5.3	Risk factors for comorbidity of social phobia and depression.....	46
2.5.4	Low self-esteem as a risk factor for social phobia and depression	47
2.5.5	Low social support as a risk factor for social phobia and depression	49
2.6	Gender differences in adolescence.....	51
2.6.1	Gender differences in physical development.....	51
2.6.2	Gender differences in the development of the brain	51
2.6.3	Gender differences in the epidemiology of psychiatric disorders and in comorbidity	52
2.6.4	Gender differences in social phobia and depression	53
2.6.5	Gender differences in self-esteem	54
2.6.6	Gender differences in social support	55
2.7	Summary of the literature	57

3	Aims of the study	59
4	Materials and methods.....	60
4.1	Study design and data collection.....	60
4.2	Ethical considerations	61
4.3	Attrition	61
4.4	Measures	64
4.4.1	Background.....	64
4.4.2	Social phobia (SP).....	64
4.4.3	Depression (DEP).....	65
4.4.4	Self-esteem (SE).....	65
4.4.5	Perceived social support (PSS).....	66
4.4.6	Other measures.....	66
4.5	Missing values	67
4.6	Covariates	67
4.7	Concepts of comorbidity and heterotypic continuity	67
4.8	Statistical methods	68
4.8.1	Methods for analysing associations between social phobia and depression (I) 68	
4.8.2	Methods for analysing associations between self-esteem and social phobia and depression: Analyses for determining cut-points of RSES (II).....	68

4.8.3	Methods for analysing associations between self-esteem and social phobia and depression: Self-esteem as a mediating factor (III)	69
4.8.4	Methods for analysing associations between perceived social support and social phobia and depression. (IV)	70
4.9	Personal involvement	71
5	Results	72
5.1	Prevalence of social phobia, depression and comorbid social phobia and depression (I)	72
5.2	Stability of social phobia, depression and comorbid social phobia and depression (I)	75
5.2.1	Heterotypic continuity	75
5.2.2	Development of comorbidity	75
5.2.3	Course of comorbidity	76
5.2.4	Social phobia as a risk factor for subsequent depression (I)	76
5.2.5	Depression as a risk factor for subsequent social phobia. (I)	76
5.3	Associations between self-esteem and social phobia and depression	77
5.3.1	The Rosenberg Self-esteem Scale discriminating adolescents with or without DEP and SP (II)	77
5.3.2	Self-esteem according to depression and social phobia (III)	78
5.3.3	Self-esteem as a mediator of the association between earlier SP and subsequent DEP, and vice versa. (III)	82
5.4	Association between perceived social support and social phobia and depression (IV)	82

5.4.1	Perceived social support and current disorder status (IV).....	82
5.4.2	Perceived social support as a risk factor for subsequent disorders (IV) ..	86
5.5	Gender differences and gender specific patterns.....	88
5.5.1	Gender differences and gender specific patterns of the prevalence of social phobia, depression and comorbid social phobia and depression. (I)	88
5.5.2	Gender specific patterns in the association between social phobia and depression (I)	88
5.5.3	Gender specific patterns on the Rosenberg Self-esteem Scale discriminating adolescents with or without DEP and SP (II).....	88
5.5.4	Gender differences in self-esteem (III).....	89
5.5.5	Gender specific patterns of self-esteem in the association between social phobia and depression (III)	89
5.5.6	Gender differences in perceived social support (IV).....	89
5.5.7	Gender specific patterns in longitudinal associations of low perceived social support with social phobia and depression (IV)	90
6	Discussion	91
6.1	Overview of the results	91
6.2	Symptomatology of social phobia and depression is common in middle adolescence	92
6.3	Association between social phobia and depression differs by gender.....	93
6.4	Low self-esteem as a risk indicator of social phobia and depression	94
6.5	Social phobia and depression is associated with self-esteem	94

6.6	Decrease in self-esteem as a mediator in the association between social phobia and depression	95
6.7	Low social support as a risk factor for depression	96
6.8	Gender differences	98
6.9	Course of social phobia and depression in middle adolescent girls and boys 100	
6.10	Methodological consideration, strengths and limitations	103
6.11	Clinical implications.....	105
6.12	Implications for future research	106
7	Summary and conclusions	108
7.1	Practical implications.....	110
7.2	Implications for further study.....	110
8	Acknowledgements.....	111
9	References	113
10	Appendix, Baseline Questionnaire items used in this study.....	138
11	Original publications.....	157

List of original publications

This dissertation is based on the following original publications. In the text they are referred to by Roman numerals.

- I. Väänänen JM, Fröjd S, Ranta K, Marttunen M, Kaltiala-Heino R (2011): Relationship between social phobia and depression differs between girls and boys in mid-adolescence. *Journal of Affective Disorders*. 133:97-104.
- II. Isomaa R, Väänänen JM, Fröjd S, Kaltiala-Heino R, Marttunen M (2012): How low is low? Low self-esteem as an indicator of internalizing psychopathology in adolescence. *Health Education & Behavior*. 40:392-399.
- III. Väänänen JM, Isomaa R, Kaltiala-Heino R, Fröjd S, Helminen M, Marttunen M (2014): Decrease in self-esteem mediates the association between symptoms of social phobia and depression in middle adolescence in a sex-specific manner: a 2-year follow-up of a prospective population cohort study. *BMC Psychiatry*. 14: 79, DOI:10.1186/1471-244X-14-79.
- IV. Väänänen JM, Marttunen M, Helminen M, Kaltiala-Heino R (2014): Low perceived social support predicts later depression but not social phobia in middle adolescence. *Health Psychology & Behavioural Medicine: an Open Access Journal*. 2:1023-1037, DOI:10.1080/21642850.2014.966716

Abbreviations

AMHC Adolescent Mental Health Cohort

AUC Area under the curve

BDI-13 13 item Beck Depression Inventory

BJS the Bremen Jugend Studie

CHDS The Christchurch Health and Development Study

CI Confidence Interval

DEP Depression, symptomatology reported by questionnaire BDI-13

DMHDS The Dunedin Multidisciplinary Health and Development Study

DSM Diagnostic and Statistical Manual of Mental Disorders

EDSP The Early Developmental Stages of Psychopathology -study

GABA Gamma-aminobutyric acid

GSMS The Great Smoky Mountains Study

ICD International Classification of Diseases and health related problems

K-SADS-PL Schedules for Affective Disorders and Schizophrenia for school-aged children –Lifetime version

M Mean, Median

MANOVA Multivariate analyses of variance

MOAFTS The Missouri Adolescent Female Twin Study

NCS The National Comorbidity Survey

NCS-A The National Comorbidity Survey Replication - Adolescent Supplement

OADP The Oregon Adolescent Depression Project

OR Odds Ratio

PSS Perceived social support

PSSS-R The Perceived Social Support Scale Revised

ROC Receiver operating characteristics

RSES The Rosenberg's Self-Esteem Scale

SD/sd Standard deviation

SE Self-esteem

SP Social phobia, symptomatology reported by questionnaire SPIN

SPIN Social Phobia Inventory

T1 Time of the baseline survey

T2 Time of the two year follow-up survey

THL Terveyden ja Hyvinvoinnin Laitos, National Institute for Health and Welfare

WHO World Health Organization

YSR Youth Self Report

Abstract

Social phobia and depression are common disorders in adolescence and frequently comorbid with each other. Despite numerous studies about the comorbidity of these disorders, little is known about the psychosocial risk factors, development and the course of the association between them. Low self-esteem and perceived social support may have an important role in the development of social phobia and depression and in the association between them. The aims of the present study were to explore the development of the comorbidity between social phobia and depression among girls and boys in adolescence. The present study focused on the role of self-esteem and perceived social support in the course of social phobia, depression and comorbid social phobia and depression.

This study was a part of the two year follow-up of The Adolescent Mental Health Cohort study (AMHC). The baseline survey of the AMHC was conducted in the 9th grades of all Finnish-speaking comprehensive schools of two cities, Tampere (200,000 inhabitants, 700 female and 783 male participants in the baseline study) and Vantaa (180,000 inhabitants, 909 female and 886 male participants in the baseline study). At baseline all students completed a printed questionnaire during a school lesson under the supervision of a teacher. Response rate at baseline was 96% in Tampere and 92% in Vantaa. The follow-up survey was conducted in secondary schools similarly as the baseline survey. If not reached that way, questionnaires were delivered to adolescent by post, and if no response was achieved to postal questionnaires, questionnaires could be responded in internet. A total of 2070 adolescents participated in both baseline (T1) and follow-up (T2) surveys, 586 girls and 577 boys in Tampere and 581 girls and 326 boys in Vantaa. Of the total sample 56.4% were girls. Mean age at baseline was 15,5 years and at follow-up 17,6 years. Self-report questionnaires were used to evaluate social phobia and depression symptoms, self-esteem and social support reported by adolescents. Symptomatology of social phobia was measured by the Social Phobia Inventory (SPIN), symptomatology of depression by the 13-item Beck Depression Inventory (BDI-13), self-esteem by the Rosenberg's Self-Esteem Scale (RSES), and perceived social support by the Perceived Social Support Scale Revised (PSSS-R).

Controlled covariates were age, family structure, both parents highest educational qualification and externalizing behaviour, measured by Youth Self Report (YSR), at T1.

There were some novel findings in the current study. Depression predicted social phobia among girls. The Rosenberg's Self-esteem Scale could be dichotomized to define low self-esteem which in turn could be used as a risk indicator for social phobia and depression. Among boys decrease in self-esteem during follow-up mediated the association between social phobia and subsequent depression and among girls decrease in self-esteem partially mediated the association between depression and subsequent social phobia. Low perceived social support from any source was not a risk factor for comorbid social phobia and depression.

The results of this study concurred with earlier findings in many cases. Prevalence rates of both disorders were mostly in accordance with those of earlier studies. Only the prevalence rates of social phobia were somewhat higher than reported in earlier studies. Heterotypic continuity was rare. Self-esteem and perceived social support were associated with disorder status. Gender differences in prevalence rates, in self-esteem and in perceived social support concurred with those of earlier studies.

Some findings did not concur with the reports from earlier studies. Social phobia did not predict depression among girls. Low perceived social support from any source did not predict social phobia in either gender, and low perceived social support from family did not predict depression.

The findings of the present study lent support to the deterioration theory of comorbidity, in which decrease in self-esteem was found to mediate, perfectly in boys and partially in girls, the effects of the previous disorder to the development of a subsequent disorder.

Tiivistelmä

Sosiaalisten tilanteiden pelko ja masennus ovat yleisiä häiriöitä nuoruusiässä, ja ne esiintyvät usein yhdessä. Huolimatta useista näiden häiriöiden samanaikaissairastavuutta koskevista tutkimuksista tiedetään vain vähän niiden välisen yhteyden kehittymisestä ja kulusta tai samanaikaissairastavuuden psykososiaalisista riskitekijöistä. Matalalla itsetunnolla ja vähäiseksi koetulla sosiaalisella tuella voi olla merkittävä osuus sosiaalisten tilanteiden pelon ja masennuksen kehittämisessä sekä niiden välisessä yhteydessä. Tämän tutkimuksen tavoitteena oli selvittää sosiaalisten tilanteiden pelon ja masennuksen välisen samanaikaissairastavuuden kehittymistä tytöillä ja pojilla nuoruusiässä. Tutkimus keskittyi selvittämään koetun sosiaalisen tuen ja itsetunnon osuutta sosiaalisten tilanteiden pelon, masennuksen ja samanaikaisen sosiaalisten tilanteiden pelon ja masennuksen kulussa.

Tutkimus oli osa Nuorten mielenterveys – prospektiivinen seurantatutkimus -hankkeen kaksivuotisseurantaa. Nuorten mielenterveys -tutkimuksen alkukysely toteutettiin kaikkien Tampereen (200 000 asukasta, alkukyselyyn osallistui 700 tyttöä ja 783 poikaa) ja Vantaan (180 000 asukasta, alkukyselyyn osallistui 909 tyttöä ja 886 poikaa) suomenkielisten peruskoulujen 9. luokilla. Kysely toteutettiin paperisin kyselylomakkein luokassa opettajan valvonnassa. Tampereen oppilaista alkukyselyyn osallistui 96% ja Vantaan oppilaista 92%. Seurantakysely toteutettiin ensisijaisesti toisen asteen kouluissa kuten alkumittauskin. Jos nuorta ei tavoitettu näin, kyselylomake postitettiin hänelle, ja jos postitettukaan kyselyyn ei saatu vastausta, nuorille tarjottiin mahdollisuutta seurantakyselyyn Internetin välityksellä. Kaikkiaan 2070 nuorta osallistui tutkimukseen sekä lähtötilanteessa (T1) että seurannassa (T2), Tampereella 586 tyttöä ja 577 poikaa ja Vantaalla 581 tyttöä ja 326 poikaa. Koko joukosta 56.4% oli tyttöjä. Vastanneiden iän keskiarvo oli alkukyselyssä 15.5 vuotta ja seurannassa 17.6 vuotta. Sosiaalisten tilanteiden pelon, masennuksen, itsetunnon ja koetun sosiaalisen tuen arviointiin käytettiin itsearviointikyselyitä. Sosiaalisten tilanteiden pelkoa mitattiin Social Phobia Inventory -kyselyllä (SPIN), masennusta 13-kohtaisella Beck Depression Inventory -kyselyllä (BDI-13), itsetuntoa Rosenberg's Self-esteem Scale - kyselyllä (RSES) ja koettua sosiaalista tukea Perceived Social Support Scale Revised -kyselyllä

(PSSS-R). Kontrolloituja lisämuuttujia olivat ikä, perherakenne, äidin ja isän koulutus ja Youth Self Report -kyselyllä (YSR) mitattu käytöshäiriöoireilu lähtötilanteessa (T1).

Tutkimus tuotti uutta tietoa masennuksen ja sosiaalisten tilanteiden pelon yhteyksistä nuoruusiässä. Masennus ennakoi sosiaalisten tilanteiden pelkoa tytöillä. Rosenbergin itsetuntomittarille määritettiin katkaisupiste matalan itsetunnon arvioimiseen, ja sitä voitiin käyttää osoittamaan myöhempää riskiä sairastua sosiaalisten tilanteiden pelkoon tai masennukseen. Itsetunnon lasku seuranta-aikana oli sosiaalisten tilanteiden pelon ja myöhemmän masennuksen välisen yhteyden välittäjä pojilla ja osittainen välittäjä masennuksen ja myöhemmän sosiaalisten tilanteiden pelon välisessä yhteydessä tytöillä. Vähäiseksi koettu sosiaalinen tuki ei ennustanut sosiaalisten tilanteiden pelon ja masennuksen samanaikaista esiintymistä.

Tulokset olivat monelta osin yhteneviä aiempien löydösten kanssa. Esiintyvyyshluvut olivat pääosin yhtäläisiä aiempien tutkimusten kanssa. Vain sosiaalisten tilanteiden pelon esiintyvyys oli tässä tutkimuksessa aiempiin tutkimuksiin verrattuna jonkin verran suurempi. Kuten aiemmissa tutkimuksissa heterotyyppinen jatkuvuus oli harvinaista. Itsetunto ja koettu sosiaalinen tuki olivat yhteydessä tutkittuihin häiriöihin. Sukupuolierot esiintymisluvuissa, itsetunnossa ja koetussa sosiaalisessa tuessa vastasivat aiempien tutkimusten havaintoja.

Osa havainnoista erosi aiempien tutkimusten löydöksistä. Sosiaalisten tilanteiden pelko ei ennakoanut masennusta tytöillä. Matalaksi koettu sosiaalinen tuki mistään lähteestä ei ennakoanut myöhempää sosiaalisten tilanteiden pelkoa eikä matalaksi koettu sosiaalinen tuki perheeltä ennakoanut masennusta kummallakaan sukupuolella.

Tämän tutkimuksen tulokset tukevat samanaikaissairastavuuden psykososiaalisen heikkenemisen teoriaa, jossa itsetunnon lasku välittää, pojilla täydellisesti ja tytöillä osittain, edeltävän häiriön vaikutuksia jälkimmäisen häiriön kehittymiseen.

1 Introduction

Developmental psychopathology and developmental epidemiology describe the development of disorders from childhood, through adolescence, to adulthood (Costello et al. 2006). Developmental epidemiologists have been interested in studying comorbidity of psychiatric disorders. Comorbidity research is an approach by which it is possible to investigate risk factors of disorders and the associations of disorders with each other (Angold et al. 1999). Comorbidity is said to exist when an individual with a disorder has one or more other disorders (Lewinsohn et al. 1991).

Social phobia and depression are prevalent disorders in adolescence (Kessler et al. 2001; Lewinsohn et al. 1993; Wittchen et al. 1999). Both of them have their onset mostly during adolescence, and frequently a chronic course continuing to adulthood (Keller 2003; Kessler et al. 2001; Lewinsohn et al. 2000). Both of them lead to functional deficiencies, affecting achievements in adult life (Kessler et al. 2001; Wittchen and Fehm 2001). Comorbidity between social phobia and depression is common; adolescents with social phobia have an approximately three-fold risk of comorbid depression (Lewinsohn et al. 1997b; Stein et al. 2001; Wittchen et al. 1999).

In adolescent general population studies early onset, severe and widespread fears and serious symptoms of preceding social phobia have found to be risk factors for subsequent depression (Kessler et al.1998; Kessler et al.1999; Merikangas et al.2002; Wittchen and Fehm 2003). Much less is known about the psychosocial risk factors for comorbidity.

Low self-esteem and poor perceived social support are issues that have been shown to be associated with depression, and to a lesser extent with social phobia. They both have been identified as risk factors for depression (Eberhart et al.2006; Lewinsohn et al. 1997a; Lin et al. 2008; Orth et al. 2008; Rosenberg 1965). Studies on low self-esteem as a risk factor for social phobia have been conducted only among adults (Acarturk et al. 2009). Also, there are only few adolescent general population studies on poor perceived social support as a risk factor for social phobia (La Greca and Lopez 1998;

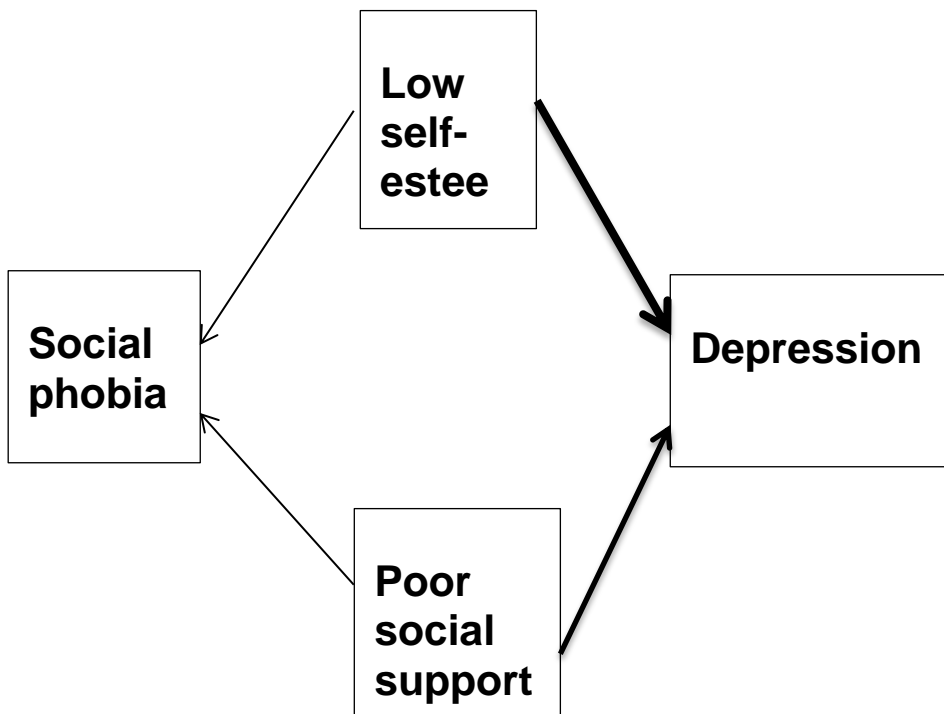
McDonald et al. 2010). There are no studies of low self-esteem or poor perceived social support as risk factors for comorbid social phobia and depression. (Figure 1)

According to the deterioration theory of comorbidity, the association between these two disorders may be mediated by a third factor. Decrease in self-esteem could be such a mediating factor as it has been shown in adult studies that social phobia (Acarturc et al. 2009; Chartier et al.1998; Izgic et al. 2004) and in adolescent studies that depression (Rosenberg 1965; Schmitz et al. 2003) are associated with low self-esteem. The first emerging disorder may lead to a decrease in self-esteem, which in turn leads to subsequent disorders, thus acting as a mediating factor.

In adolescent general population studies gender differences in social phobia and depression have been shown to exist in epidemiology, risk factors and consequences of the disorders (Hankin 2009; Wittchen et al. 1999). There are also gender differences in self-esteem (Rosenberg 1965), and in perceived social support (La Greca and Lopez 1998). Therefore the associations between social phobia and depression and factors influencing these associations may differ between girls and boys.

The hypotheses of the associations of social phobia and depression include that there are shared risk factors for both disorders, that social phobia is a risk factor for depression (or vice versa), or that social phobia leads to psychosocial or neuropsychological deterioration, which leads to depression (Merikangas et al. 1996). These hypotheses, however, have not been studied in adolescent samples. To better understand the emergence of these two common and invalidating disorders in adolescence it is important to fill these gaps in our knowledge in the association between them and in the role of psychosocial factors in these associations in adolescent girls and boys. Enhancing knowledge of these associations contributes also the development of the preventive and therapeutic interventions for adolescent girls and boys suffering from social phobia, depression and comorbid social phobia and depression.

Figure 1. Connections of low self-esteem and poor social support with social phobia and depression. The heavier the arrow connecting the boxes the more research evidence on the existence of these connections has been presented in the literature.



2 Review of the literature

2.1 Development in adolescence

Adolescence is a developmental phase, which begins at puberty, on average at the age of 11 to 13 years and ends on average at age of 19 to 22 years (Aalberg and Siimes 2007; King 2002). WHO delineates adolescence as a period of life between ages 10 and 19 years (WHO 2014).

2.1.1 Development of identity

The main developmental task of adolescence is the formation of adult identity (Erikson 1968; Moshman 2011). Adolescence is divided into early adolescence, middle adolescence and late adolescence (Blos 1962; Sadock et al. 2009; King 2002). All these phases have specific developmental tasks (Aalberg and Siimes 2007; Blos 1962). The main developmental challenges during adolescence are developing a satisfactory and realistic body image, increased independence from parents, satisfying relationships outside the family, appropriate control and expression of increased sexual and aggressive drives and consolidated identity. Developed identity includes personal moral code and at least provisional plans for an occupation and economic self-sufficiency (King 2002; Moshman 2011). In middle adolescence sexual development, this starts in early adolescence, proceeds. Integration of one's experiences and emotions improves with the enhanced cognitive capacity of the adolescent (Aalberg and Siimes 2007). Adolescents reach out from their parents, preferring friends as source of emotional satisfaction. In mid-adolescence there is ambivalence about separation (King 2002). Individuals describe themselves typically in inconsistent ways (for example, shy outside home, outgoing at home) in middle adolescence (Harter and Monsour 1992). Peer groups are important and the adolescent at this age is sensitive to experiences of separation and rejection (Aalberg and Siimes 2007). Peer cliques change in middle adolescence from single-sexed to mixed-sexed, leading to cliques of dating couples in late adolescence (Steinberg and Morris 2001). Although most adolescents pass through

this phase without great turmoil, many adolescents do things which are against norms (Steinberg and Morris 2001).

2.1.2 Development of the brain

Remarkable changes occur in the brain during adolescence. There is an increase in white matter volumes in several brain regions during childhood and adolescence. White matter volume increases more rapidly at early age, on slower rate in adolescence, and the increase levels off during young adulthood (Blakemore 2012; Paus et al. 2008). The volume of grey matter increases during childhood, with subsequent decline during adolescence. In the frontal lobe and parietal lobe the peak occurs at around 12 years, and in the temporal lobes the peak is at around 17 years. Sensory and motor regions mature earliest and frontal and temporal lobes later (Blakemore 2012; Colver and Longwell 2013; Paus et al. 2008).

Decrease in grey matter during adolescence has been attributed to synaptic pruning (Blakemore 2012; Colver and Longwell 2013). Pruning occurs in the rarely used synaptic connections, leading to a more efficient and specialized brain (Colver and Longwell 2013).

The social brain is defined as the network of brain regions involved in understanding other people. The neural strategy for thinking about other people's intentions changes from adolescence to adulthood (Blakemore 2012). Interactions between different neural networks diminish with age, which may reflect enhanced within-network connectivity and more efficient between-network influences (Blakemore 2012).

Studies on the development of the neurotransmitter systems have mostly been conducted on animals and are not necessarily generalizable to humans. Between ages 11 and 25 years dopaminergic activity increases in the pre-frontal cortices, striatum, limbic system and the pathways linking them (Colver and Longwell 2013). The subcortical dopamine system reaches its peak in adolescence, but the cortical system develops more slowly and reaches its peak in early adulthood (Li 2012; Padmanabhan and Luna 2014). Serotonin is a neuromodulatory neurotransmitter serving a wide array of physiological and behavioural functions (Daws and Gould 2011). Adolescence may be characterized by a temporally limited increase in the ratio of dopamine to serotonin. This may have functional implications for the excitability of the prefrontal cortex

biasing behaviours in the direction of “go” relative to “stop” signals (Wahlstrom et al. 2010). During adolescence there is proliferation of oxytocin receptors. Oxytocin has a role in a variety of social behaviors, including social bonding in maternal behaviour and hostility to those outside a person's core social group (Colver and Longwell 2013). Gamma-aminobutyric acid (GABA) constitutes the main inhibitory neurotransmitter of the central nervous system (Vigil et al. 2011). The GABA system in adolescence acts differently than in adulthood and may be responsible for the excitement phenomena as opposed to inhibitory phenomena in adult life (Vigil et al. 2011). The balance between various GABAergic functions can be readjusted until the end of adolescence (Kilb 2011).

The relative maturity of subcortical systems and the immaturity of the prefrontal cortex, which is critical to cognitive control, may lead to a greater adolescent propensity toward sensation seeking and risk taking. There is relative inter-regional imbalance of different brain areas during adolescence, in contrast to childhood, when these regions are all relatively immature and adulthood, when they all are mature (Sturman and Moghaddam 2011). The activation of the limbic system exceeds that of the cortical systems, leading to the predominance of the emotional component of behaviour. Towards the end of adolescence, neural activity in both systems reaches similar values (Vigil et al. 2011).

Adolescence is characterized by major changes in the neural systems subservient to higher cognitive functions, reasoning and interpersonal interactions, cognitive control of emotions, risk-versus-reward appraisal and motivation. These changes, when suboptimal in timing or magnitude, increase the risk of cognitive, affective and addictive disorders during adolescence (Paus et al. 2008). These findings on the development of the adolescent brain further emphasize the risk for the emergence of affective and anxiety disorders during this specific period of life. Thus studies on the development of these disorders should be conducted during adolescence.

2.1.3 Cognitive development

Cognitive development during the adolescent years is characterized by gradually attaining the capacity for abstract thought and hypothetical-deductive reasoning (Culbertson et al 2003; Moshman 2011). From childhood into adolescence, there is an increased ability to plan and organize an improved ability to solve problems as well as

increased abilities and better cognitive control in the realms of attention and memory (Taylor et al. 2011). In adolescence there occurs a transition from concrete thinking (concrete operational thinking) to abstract thinking (formal operational thinking) (Sadock et al. 2009). Adolescents experience improvements in their information-processing abilities, such as advances in selective and divided attention, increases in working memory and long-term memory, and an increase in speed of information processing. Adolescents have an improved ability to develop hypotheses and then systematically deduce the best strategies for solving a particular problem. They become able to monitor their own thoughts and feelings, as they use a formal operational cognitive style. Adolescents may believe that their own experiences are unique, and this can lead to risky behaviour because they feel invincible. They also may believe that their behaviour is the focus of interest or concern for everyone else around them (Culbertson et al. 2003). Adolescents develop the capacity to develop hypotheses, express altruism, create idealistic scenarios, and develop hopes and dreams for the future (Sadock et al. 2009).

Developmental cognitive neuroscience is a novel research stream connecting the development of cognitive functions to brain development. The premise of developmental cognitive neuroscience is that changes in brain activity and improvements in behavioural control across adolescent development are related to maturation of the brain (Stevens et al. 2009). Developmental changes strengthen the integration of key regions and weaken dynamic interactions with unnecessary regions (Stevens 2009). The prefrontal cortex especially is involved in these executive functions (Taylor et al. 2011). These developmental changes represent relationships between improving executive control over behaviour and maturing hierarchical relationships between entire functional networks (Stevens 2009). The development of the cognitive functions and neural networks between different brain regions may lead to quite permanent patterns of cognitively and emotionally interpreting and reacting, for example, to social situations or experiences later in life. These patterns may lead to anxiety in social situations or to susceptibility to episodes of depression, further underscoring the importance of conducting studies on the development of these disorders during developmental period of adolescence.

2.1.4 Developmental epidemiology and developmental psychopathology

The interaction between developmental psychopathology and psychiatric epidemiology has produced the research approach called developmental epidemiology. Developmental epidemiology studies patterns of distribution of psychiatric disorders in time as well as in space (Costello et al. 2006). Developmental psychopathology concerns the evolution of symptoms over an individual's developmental stages and how these symptoms lead to certain disorders. The onsets of different psychiatric disorders have their specific timing patterns. There is a group of disorders of which the majority have their onset in childhood (attention-deficit/hyperactivity disorder, autism and pervasive developmental disorder, separation anxiety, specific phobia, oppositional defiant disorder) while others usually begin in adolescence (social phobia, panic disorder, substance abuse, depression, anorexia nervosa, bulimia nervosa, schizophrenia, substance use disorders) (Costello et al. 2006; Paus et al. 2008). (Figure 2). According to general population studies the prevalence of psychiatric disorders increases from childhood through adolescence reaching its peak in young adulthood, being about twice higher in adolescence than in childhood (Costello et al 2011).

Those large epidemiological studies referred to in this study, based on general population and reporting prevalence rates of social phobia and/or depression, and/or comorbidity are listed in Table 1. In the Dunedin Multidisciplinary Health and Development Study (DMHDS), the birth cohort of 1.4 1972-31.3.1973 was followed up at ages 3, 5, 7, 9, 11, 13, 15, 18 and 21 years. In the DMHDS disorders were determined by diagnostic interview (Newman et al. 1996). The Great Smoky Mountains Study (GSMS) is a longitudinal general population cohort study in which children and early adolescents (9-13 years) were assessed at intake and annually up to middle adolescence (16 years). Disorders were determined by diagnostic interview (Costello et al. 2003). The National Comorbidity Survey Replication - Adolescent Supplement (NCS-A) is an adolescent study replicating the earlier National Comorbidity Survey (NCS). Both NCS and NCS-A are cross-sectional studies, using diagnostic interview to determine diagnoses (Merikangas et al. 2010). The Early Developmental Stages of Psychopathology (EDSP) is a large German prospective general population study of adolescents and young adults aged 14-24 setting diagnoses by means of diagnostic interviews (Whittchen et al. 1999). The Oregon Adolescent Depression Project (OADP) is prospective general population study on subjects from age 14 years determining disorders by diagnostic interview (Lewinsohn et al. 1998). The Christchurch Health and Development Study (CHDS) is a birth cohort study in

New Zealand using self-report questionnaires to measure symptomatology (Fergusson et al. 1996). The Bremen Jugend Studie (BJS) is a prospective study on adolescents aged 12-17 years, in which disorders were determined by diagnostic interview (Essau et al. 1999). The Missouri Adolescent Female Twin Study (MOAFTS) is a twin study on girls aged 13.5-19.5 years determining disorders by diagnostic interview (Nelson et al. 2000). In these studies, lifetime prevalence rates for social phobia varies from 1.6% to 16.3% and lifetime prevalence rates for depression varies from 11.7% to 20.4%.

In the DMHDS mental disorders increased longitudinally from late childhood (18%) through middle (22%) to late adolescence (41%) and young adulthood (40%). Developmental history of mental disorder was found in 73.8% of adults diagnosed at the age of 21 years (Newman et al. 1996). (Table 1). In the GSMS the prevalence of any disorder in childhood was highest at age 9-10 years, falling to its lowest level at age 11-12 years and then rising again during adolescence. Twelve years was the age when childhood disorders had almost disappeared, especially among boys, while those of adolescence and adulthood had not yet developed (Costello et al. 2003). (Table 1). In the NCS-A the median age of onset for anxiety disorders was 6 years, for behaviour disorders 11 years, for mood disorders 13 years, and for substance use 15 years (Merikangas et al. 2010). The earliest disorders were specific phobias and ADHD (6 years) separation anxiety disorder (8 years). Panic disorder, social phobia, agoraphobia and bipolar disorder (14 years), eating disorders (15 years) and substance use disorders (16 years) were latest to emerge (Kessler et al. 2012).

Psychiatric disorders have different impacts on functioning in different developmental periods. In the GSMS only 20% of boys and 31% of girls aged 9-10 years with some psychiatric disorder were assessed as significantly impaired, but by the age of 16 years 79% of diagnosed boys and 58% of diagnosed girls were significantly impaired (Costello et al. 2003).

Figure 2. Typical ages of onset of certain major child and adolescent disorders according to the literature. SP=social phobia, DEP=depression, ADHD= Attention deficit hyperactivity disorder, TD= Tourette,s Disorder CD= conduct disorder, AN=anorexia nervosa, SCH=Schizophrenia, SUD= Substance use disorder (Costello et al. 2003; Costello et al. 2006; Merikangas et al. 2010; Sadock et al 2009; Paus et al. 2008).

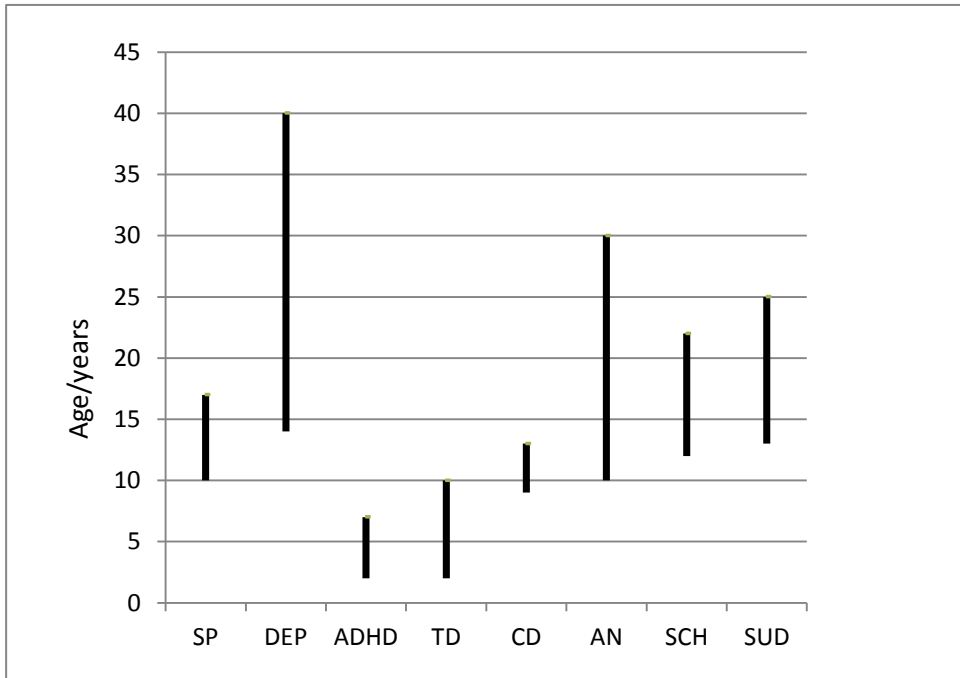


Table 1. Epidemiological adolescent general population studies reporting prevalence rates of social phobia and/or depression, and/or comorbidity. DEP= depression, SP= social phobia

Study	Study design Assessment	N	female male	age/ years	ref	prevalence DEP/SP	of	country
The Dunedin Multidisciplinary Health and Development Study (DMHDS)	Prospective birth cohort Interview: Diagnostic Interview Schedule (DIS	1037	F 48% M 52%	0-21	Newman et al. 1996	Lifetime DEP 19.8% SP 9.7%		New Zealand
The Great Smoky Mountains Study (GSMS)	Prospective cohort ages 9-, 11- and 13- year cohorts. Interview: The Child and Adolescent	1420	F 45.0% M 55.0%	9-13	Costello et al. 2003	Three months at age 15 DEP 3.7%		USA

	Psychiatric Assessment (CAPA)						
The National Comorbidity Survey Replication-Adolescent Supplement (NCS-A)	Cross-sectional Interview: Composite International Diagnostic Interview (CIDI)	10123	F 51% M 49%	9-18	Merikangas et al. 2010	Lifetime DEP 11.7% SP 9.1%	USA
Early Developmental Stages of Psychopathology Study (EDSP)	Prospective from age 14- years Interview: computer-assisted personal interview (CAPI) version of the Munich-Composite International Diagnostic Interview (M-CIDI)	3021	F 49% M 51%	14-24	Whittcen et al. 1999	Lifetime SP females 9.5% males 4.9%	Germany

Oregon Adolescent Depression Project (OADP)	Prospective from age 14 years Interview: Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SDAS)	1709	F 52% M 48%	14-19	Lewinsohn et al. 1998	Lifetime DEP 20.4%	USA
Christchurch Health & Development Study, (CHDS)	Prospective birth cohort study Self-report questionnaire: Self report version of Diagnostic Interview Schedule for Children	1265		0-21	Fergusson and Horwood 2001 Fergusson et al. 1996	Lifetime DEP 18.2%	New Zealand

<p>Bremen Adolescent Study [Bremen Jugend Studie] (BJS)</p>	<p>Prospective from age 12-years.</p> <p>Computerised version of the Munich-Composite International</p> <p>Diagnostic Interview</p>	<p>1035</p>	<p>F 59%</p> <p>M41%</p>	<p>12-17</p>	<p>Essau et al. 1999</p>	<p>Lifetime</p> <p>SP 1.6%</p>	<p>Germany</p>
<p>The Missouri Adolescent Female Twin Study (MOAFTS)</p>	<p>Prospective twin study from age 13,5 years</p> <p>Interview: Parental and twin structured diagnostic interviews adapted for telephone administration</p>	<p>2746</p>	<p>F100%</p>	<p>13,5-19,5</p>	<p>Nelson et al. 2000</p>	<p>Lifetime</p> <p>SP 16.3%</p>	<p>USA</p>

2.2 Psychiatric disorders in adolescence

The epidemiology of child and adolescent psychiatric disorders has its roots in the late 1960s. Before that, there were no data on the epidemiology of child and adolescent psychiatric disorders (Szatmari 2009).

Current prevalence estimates of any mental disorder in adolescent population have varied from 18% to 25% when earlier diagnostic definitions were used (Rutter's scales, - a set of questions which combine to give an index of behaviour difficulties in the child -, Diagnostic and Statistical Manual of Mental Disorders (DSM) DSM-III or DSM-III-R) (Fergusson et al. 1993; Kashani et al. 1987; McGee et al. 1990; Newman et al. 1996; Rutter et al. 1976). Of the adolescent general population studies using DSM-IV definitions of the psychiatric disorders in the GSMS the three-month prevalence of any disorder averaged 13.3%. Until the age of 16 years 36.7% of participants had at least one psychiatric disorder. At age 21 years 61.1% had had at least one well-specified disorder (Copeland et al. 2011; Costello et al. 2003). In the NCS-A study, also according to DSM-IV criteria, lifetime prevalence of at least one disorder was 49.5%. Most common were anxiety disorders, 31.9%, followed by behaviour disorders 19.1%, mood disorders 14.3%, and substance abuse disorders 11.4%. The prevalence of disorders with severe impairment and/or distress was 22.2%, (mood disorders 11.2%, anxiety disorders 8.3%, and behaviour disorders 9.6%) (Kessler et al. 2012; Merikangas et al. 2010).

The Finnish School Health survey, a general population study, used self-report questionnaires for assessment of a wide range of welfare related issues among adolescents in the 8th and 9th degree in comprehensive schools (13-15 year olds) and in the 1st and 2nd degree of the secondary schools (16-17 year olds). In this survey prevalence of strong anxiety was 5-7% in boys and 13-18% in girls (National Institute for Health and Welfare 2014).

The range of reported prevalence rates in adolescent population studies about the psychiatric disorders is very wide, varying approximately from 2% to 45%. Prevalence rates depend on the criteria used in defining disorders, mostly whether or not impairment criteria are included (Costello et al. 2005; Kieling et al. 2011). High prevalence rates are reported in general population studies using diagnostic interviews or self-report questionnaires.

There are no representative and encompassing general population epidemiological surveys of adolescent mental disorders based on diagnostic interviews conducted in Finland. Some large studies using information from the Finnish Hospital Discharge Register have been published. According to these, the prevalence rates of psychiatric disorders are lower than in general population studies using self-report questionnaires. According to the Finnish Hospital Discharge Register in the general population based Northern Finland 1986 Birth Cohort the cumulative incidence of new hospital treated non-psychotic disorders was 1.4% and of psychoses was 0.4% (altogether 1.8% hospital treated mental disorders) in patients aged 17 to 23 (Mäki et al. 2014). In the nationwide Finnish 1981 birth cohort study on subjects aged 13-24 years 6.2% of the males and 4.1% of the females were admitted to psychiatric hospital for any reason. Substance abuse disorders were the most common psychiatric reasons for admission to hospital among males (1.8%, n = 48), and nonpsychotic mood disorders among females (1.9%, n = 50) (Gyllenberg et al. 2010).

2.2.1 Social phobia

Social phobia, also called social anxiety disorder, is a disabling psychiatric condition, characterized by fear of negative evaluation by others (Lepine and Pellisollo 2000). The DSM-IV (American Psychiatric Association (APA) 1995) defines social phobia as being characterized by intense fear in one or more social situations, causing considerable distress and impaired ability to function in at least some aspects of daily life. The International Classification of Diseases and health related problems 10 (ICD 10) (World Health Organization (WHO) 1992), in turn, defines social phobia as a fear of being the focus of observation of others, leading to avoidance of social situations. Two subtypes of social phobia have been identified: "non-generalized" and "generalized". In non-generalized social phobia there are only few feared situations, while in the generalized type the fears and avoidance behaviour are widely spread over many situations and in many places (Lepine and Pelissolo 2000).

In adolescent general population studies the point prevalence of social phobia has been estimated to vary from 1.6% to 6%, and the lifetime prevalence from 7% to 14% (Essau et al. 1999; Gren-Landell et al. 2009; Shields 2004; Wittchen et al. 1999). A subtype of social phobia including solely fear of speaking is most prevalent, while the generalized type is most infrequent. In the EDSP the lifetime prevalence of social phobia restricted solely to fear of speaking was 7.0% while the prevalence of social phobia characterized by

generalized or complex fears was 5.9 %.(Wittchen et al. 1999). The lifetime prevalence of social phobia in the NCS-A was 9.1%, but only 14.3% of these cases were severely impaired. The prevalence increased among older age groups being 6.6% at 13-14 years, 9.7% at 15-16 years and 10.1% at 17-18 years (Merikangas et al. 2010). The most feared situations among adolescents suffering from social phobia have been found to be performance/test situations (31.1%), public speaking (19.7%), talking with/to others (9.2%), and eating or drinking in public (Essau et al. 1999).

In the Finnish general population study 784 adolescents at age 12-17 years were screened by self-report questionnaire and a sub-sample of 350 adolescents were assessed by semi-structured diagnostic interview 12-month prevalence for social phobia was 3.2%. Prevalence increased in older adolescents (Ranta et al. 2009).

Social phobia typically begins between ages 10 to 17 years (Weiller et al. 1996; Wittchen and Fehm 2003). In a clinical study on outpatient settings more than 90% of patients having a lifetime diagnosis of social phobia reported an onset before the age of 25 (Weiller et al 1996). In the DMHMS, nearly 80% of social phobias at age 21 had started before age 18 years (Newman et al. 1996). The course of social phobia is usually chronic and recurrences are common, and it is regarded as a lifelong illness (Keller 2003). During adolescence the course of social phobia is characterized by waxing and waning of symptoms (Wittchen and Fehm 2003). There is fluctuation in symptoms and there may be some symptom-free periods during the course of the illness (Chartier et al. 1998; Wittchen and Fehm 2001). Adults with social phobia have reported extensive functional disability, less life satisfaction, and a lower quality of well-being compared to those without social phobia (Stein and Kean 2000). They have received less education and are more likely to be unemployed and less often married than individuals without social phobia (Keller 2003). Keller concluded in his review article (2003) that 'people with social phobia experience greater impairment of functioning than those with other chronic psychiatric disorders such as depression, or medical disorders such as advanced coronary artery disease and diabetes'. The National Comorbidity Survey (NCS) was a large (N=8098) epidemiological study among mixed adolescent and adult population (15-54 years). Social phobia was the only adolescent disorder assessed in the NCS that significantly predicted failure to continue to college both as a pure or comorbid disorder (Kessler 2003).

In a clinical adult outpatient study on patients with social phobia without depression the main reason for contacting health care was rarely a psychological problem (Weiller et al. 1996). Furthermore, in studies among adults suffering from pure social phobia, treatment

seeking was more rare when the disorder was more severe: if there were only 1-4 situations causing fears, 26% had sought treatment while only 14% of those with 8-10 fears and 8.4% of those with 11+ feared situations had sought help (Ruscio et al. 2008). Seeking treatment is also delayed: in the NCS seeking help took place approximately 15 years after first symptoms had appeared (Kessler et al. 1998).

2.2.2 Depression

Depression is claimed to be the single largest contributor to the global burden of diseases for people aged 15-19 years (United Nations Children's Fund (Unicef) 2011). Diagnostic classifications DSM-IV, (American Psychiatric Association (APA) 1995), and ICD 10 (World Health Organization (WHO) 1992) emphasize the commonalities of depressive disorders in all age groups from childhood through adolescence to adulthood. In the OADP, defining disorders by diagnostic interview, the most frequent symptoms of adolescent depression were depressed mood (97.7%) thinking difficulties (81.8%), sleeping difficulties (88.6%) and weight/appetite disturbances (79.5%). The least frequent symptom was thoughts of death/suicide, even though over half of the patients reported them (54.5%). Of depressed adolescents 41% had suicidal ideation and 21% reported having attempted suicide. Suicidal ideation was associated with long-lasting and recurrent depressive episodes (Lewinsohn et al. 1998).

The point or one-month prevalence of depression in adolescence general population studies based on diagnostic interviews has ranged between 3.1 and 7.2% (Costello et al. 2011; Coughlan et al. 2014). The lifetime prevalence of adolescent depression in community based surveys has varied between 15 and 25% (Copeland et al. 2011; Coughlan et al. 2014; Kessler and Walters 1998; Kessler et al. 2001; Lewinsohn et al. 1993). The prevalence of depression begins to increase in early adolescence and continues to increase during adolescence (Avenevoli and Steinberg 2001). In the NCS the 1-month prevalence of depression in 15-16 year-olds was 9.6% and in 17-18 year olds the corresponding prevalence was 10.4% (Kessler and Walters 1998). The lifetime prevalence of depression among 15-18 year olds was 25% (Kessler and Walters 1998). In the NCS-A the lifetime prevalence of depression at age 13-18 years was 11.7%. The prevalence of depression increased in older age-groups. The prevalence was 8.4% at age 13-14 years, 12.6% at age 15-16 years, and 15.4% at age 17-18 years (Merikangas et al. 2010). The prevalence of depressive episode was 18.1% (Kessler et al. 2012). In the EDSP study 12-

month prevalence of depression was 8.3% and lifetime prevalence was 14.8% (Wittchen et al., 1998).

In a Finnish general population study, the School Health Promotion Study, 36 549 14-16 year old adolescents were assessed by self-rating questionnaires. Prevalence of depression measured by 13-item Beck Depression Inventory was 13.4% in girls and 6.8% in boys (Kaltiala-Heino et al. 2003). In a Finnish longitudinal general population study 887 females and 761 males were followed from 16 years to 22 years. In young adulthood prevalence of depression was 13% among females and 9% in males measured by self-report questionnaire 13-item Beck Depression inventory (Pelkonen et al. 2003). In the Finnish School Health Survey for 2010/2011 prevalence rates of depression measured by the 13-item Beck Depression Inventory (BDI-13) were 13% in 8th and 9th grade pupils of comprehensive school (14-15 years of age) and 10% in 1st-2nd grade college pupils, and 12% in 1st-2nd grade pupils of vocational school (National Institute for Health and Welfare 2014). In the Finnish Health Care Survey '96, a cross-sectional nationwide study with diagnostic interview, in a random sample of 509 adolescents aged 15-19 years, the 12-month prevalence of major depressive episode was 5.3% (Haarasilta et al. 2001). In the Health 2000 survey prevalence of possible major depression among 18-24 year old females was 18.3% and 5.7% among males using interview constructed from DSM-IV diagnostic criteria (Pirkola et al. 2005).

According to large general population studies the mean age of onset of juvenile depression is 13-15 years. In the OADP the mean age of onset of adolescent depression was 14.9 years. Earlier onset of major depression was associated with being female, lower parental education, the presence of psychiatric comorbidity, and a history of attempted suicide (Lewinsohn et al. 1998). Earlier age at onset was reported in the GSMS, in which the first depressive symptom could be traced back to age 10.7 for those who fulfilled DSM IV criteria for major depression at age 16 (Costello et al. 2006). In the NCS-A the mean age of onset of mood disorders was 13 years (Merikangas et al. 2010). In the DMHMS 71.2% of the major depression cases at age 21 had emerged before age 18 (Newman et al. 1996).

In the OADP the mean duration of episodes of adolescent major depression was 26 weeks, being highly skewed. The median duration of episodes was 8 weeks. Earlier onset of depression was associated with longer episodes. Of adolescents who recovered from the depressive episode 5% experienced another episode within six months and 33% within four years (Lewinsohn et al. 1998). In the NCS subsample of 15-24 year olds the average length of the episode of adolescent major depression was 32.5 weeks. Of

adolescents with major depression 11.8% reported a chronic course of the illness (Kessler and Walters 1998). In a review of longitudinal epidemiological studies and treatment samples Kessler et al. (2001) concluded that the continuity of juvenile depression over time was substantial, and that the risk of recurrence was especially high in early onset depression.

Mood disorders with an early onset have been found to be associated with many functional impairments, such as truncated educational attainment, teen childbearing, later substance abuse (Kessler et al. 2001; Lewinsohn et al. 2000), and poor health related quality of life (Bettge et al. 2008). In the NCS-A depression caused severe impairment in 74.4% of cases (Merikangas et al. 2010). Adolescents with major depression have increased rates of suicidal ideation with an odds ratio of 5.4, and suicide attempt with an odds ratio of 12.1 (Fergusson et al. 2003).

2.3 Comorbidity and continuity of adolescent psychiatric disorders

Comorbidity is said to exist when an individual has two or more disorders at the same time (Lewinsohn et al. 1991). The interval of co-occurrence may be defined narrowly (at the same moment), “current comorbidity”, or more broadly (within 6 months or a year) or even refer to the whole lifetime, “lifetime comorbidity” (Costello et al. 2006; Lewinsohn et al. 1991). Comorbidity is common in adolescent psychiatric disorders, the prevalence rates ranging from 40% to 70% in general population (Angold and Costello 1993; Kashani et al. 1987; Rohde et al. 1991). In a clinical outpatient sample more than 95% of adolescents seeking treatment for major depression had at least one comorbid disorder (Biederman et al. 1995). In a Finnish survey any comorbid disorder was diagnosed in 78.4% of the outpatients with depression, and in 76.4% of the controls with depression in non-clinical population (Karlsson et al. 2006). Of adolescents with a psychiatric disorder 10% to 50% had two or more comorbid diagnoses (Fergusson et al. 1993).

In a meta-analysis of general population studies on comorbidity in child and adolescent psychiatry the highest levels of comorbidity were between disruptive behaviour disorders and Attention Deficit Hyperactive Disorder (ADHD), and between anxiety disorders and depression (Angold et al. 1999). In the GSMS comorbidity (co-occurrence within three months), between anxiety disorders and depression was seen in 25.5% of cases (Costello et al. 2003). In the CHDS depression at age 14-16 years increased the risk for subsequent anxiety disorders, the odds ratio being 3.9 (Fergusson and Horwood 2001; Fergusson et al.

1996). Lifetime prevalence of having at least one comorbid disorder has been found to be 70-81% among both adolescent and adult patients with social phobia (Keller 2003; Magee et al. 1996; Schneier et al.1992). In the NCS-A the three most consistent predictors of some subsequent comorbid disorder were social phobia, specific phobia and major depression (Kessler et al. 2012).

In general, comorbidity may lead to a more severe or chronic illness course and more impairment. It is associated with increased likelihood of seeking help but it complicates treatment. Comorbidity is associated with various social disadvantages and increased societal costs (Caron and Rutter 1991; Newman et al. 1996; Wittchen et al. 1998).

In developmental psychopathology, homotypic continuity refers to the continuity of some phenomenon, for example a disorder, over time in a form that changes relatively little. For example, a disorder with onset in childhood continues to adolescence. On the contrary heterotypic continuity refers to a continuous process that generates different phenotypes over time. For example, a certain disorder in childhood manifests as another type of disorder in adolescence without coexisting as in comorbidity (Angold et al. 1999).

In adolescents homotypic continuity is common, whereas heterotypic continuity is relatively rare. Three patterns of heterotypic prediction have received consistent support. Anxiety and depression tend to cross-predict each other from childhood/adolescence to adulthood, childhood/adolescent conduct/oppositional problems tend to precede adult anxiety and depression, and adolescent conduct disorder predicts adult substance use disorders (Costello et al. 2011).

In the DMHMS homotypic continuity among those with anxiety disorder was more common than among those with depressive disorder, and heterotypic continuity was more common among those with depression. Of those with anxiety disorder at age 21, 61.5% had had an anxiety disorder earlier and 18.9% some other disorder. Of those with mood disorder 45.3% had previously had a depressive disorder, and 26.9% some other type of disorder (Newman et al. 1996). In the GSMS heterotypic continuity was relatively rare, but there was heterotypic continuity from depression to anxiety, which was affected by the high levels of concurrent comorbidity (Costello et al. 2003). There are no earlier reports on the homotypic or heterotypic continuity of social phobia and depression.

2.4 Concurrent and longitudinal associations between social phobia and depression

2.4.1 Comorbidity between social phobia and depression

Social phobia has been reported to have a high prevalence of concurrent comorbidity with other anxiety disorders, depression and substance abuse disorders in adolescent population (Wittchen and Fehm 2001). In the BJS, 41.2% of the adolescents with social phobia also met the criteria for any somatoform disorders, 29.4% had a depressive disorder and 23.5% had a substance use disorder (Essau et al. 1999). In the EDSP study, social phobia was found to be highly co-morbid with other psychiatric disorders, particularly with other anxiety disorders and depressive disorders. At least one comorbid disorder was found in two thirds of adolescents with generalized social phobia (Bittner et al. 2004; Stein et al. 2001; Wittchen et al. 1999). In a recent Finnish general population study, 41% of 12–17-year-old adolescents with social phobia had comorbid depression (Ranta et al. 2009). The comorbidity between social phobia and depression seems to emerge in adolescence. In a clinical study on children and early adolescents aged 7-13 years in outpatient settings comorbidity was rare: depression was prevalent in only 6% of subjects with social phobia (Beidel et al. 1999).

Similarly adolescents with depression have high rates of concurrent comorbid social phobia. In a Finnish clinical outpatient study on adolescent depression, anxiety disorders were the most common comorbid disorders. Any anxiety disorder occurred in 57% of depressed patients as a comorbid disorder (Karlsson et al. 2006). Comorbid social phobia was found in 17% of depressed patients (Karlsson, personal communication). In a clinical outpatient study individuals with childhood onset major depressive disorder had significantly higher rates of comorbid social phobia than those with adult onset major depressive disorder (48.9% versus 25.7%) and individuals with adolescent onset major depressive disorder displayed intermediate lifetime rates of social phobia (Alpert et al. 1999).

Longitudinal general population studies of social phobia among adolescents have shown an approximately threefold risk for subsequent depression. In the EDSP study, for those who had generalized social phobia, the odds ratio for having a subsequent depressive episode was 3.5 (Bittner et al. 2004; Stein et al. 2001; Wittchen et al. 1999). In the ten-year follow-up for those with any kind of social phobia at baseline the odds ratio of having

subsequent depression was 3.2 (Beesdo et al. 2007). In the OADP the odds ratio of having subsequent major depression was 3.3 for those with social phobia (Lewinsohn et al. 1997b). In the MOAFTS the odds ratio was 3.2 (Nelson et al. 2000).

In a general population-based prospective study on adults, the incidence rate ratio for social phobia in one year was 3.6 in subjects with major depression (Acarturc et al. 2009). No earlier adolescent general population studies on risk for subsequent social phobia among subjects with depression have been reported.

2.4.2 Development of comorbidity between social phobia and depression

Social phobia has shown to precede depression in most comorbidity studies. In adult studies 72%-100% of cases of social phobia have reported to emerge at least one year earlier than depression (Kessler et al. 1999; Magee et al. 1996; Merikangas et al. 1996; Merikangas et al. 2002; Shields 2004; Weiller et al 1996). Depression has preceded social phobia in approximately 10-22% of cases, and both disorders have emerged concurrently in the same year in approximately 10-15% of cases (Kessler et al. 1999; Weiller et al. 1996). The mean time span between emergences of disorders in the NCS was 12.3 years when social phobia preceded depression and 7.7 years when depression preceded social phobia, measured retrospectively among 15-64 year-olds (Kessler et al. 1999). In the MOAFTS, part of the female adolescent sample traced back the emergence of social phobia and depression, remembering social phobia to be the preceding disorder (Nelson et al. 2000). There is a lack of truly prospective adolescent studies exploring the order of emergence of social phobia and depression in comorbidity of them.

2.4.3 Consequences of comorbidity between social phobia and depression

Comorbidity with social phobia has been shown to have a negative effect on the prognosis of depression. Individuals with comorbid social phobia and depression have lower recovery rates, more difficult symptomatology and more functional impairment in follow-up compared to individuals with depression alone. In the EDSP study the duration of depressive episodes was found to be longer and recurrence of episodes more common in comorbid depression and social phobia than in depression without social phobia. Comorbidity was also associated with more absence from school and lowered work productivity, and with greater invalidity (Wittchen et al. 1999). Suicidal ideation and

suicidal acts were more common in subjects with comorbid depression than in those with depression without social phobia in both the EDSP study and in the MOAFTS (Nelson et al. 2000; Stein et al. 2001). In the EDSP study the odds ratio for suicidal acts was 7.0 when comorbid social phobia and depression were compared to depression alone (Stein et al. 2001). Comorbid social phobia also contributed to increased substance abuse disorders among women in the MOAFTS (Nelson et al. 2000). There were twice as many functional deficiencies, and 66% more depressive episodes among those suffering from comorbid depression and social phobia than among those with depression alone in a study of mixed adolescent-adult population (Kessler et al. 1999).

The effects of comorbidity on the prognosis of social phobia have not been shown to be as marked as on the prognosis of depression. In most cases the main reason for disabilities is social phobia. In the EDSP study about one fifth of individuals with comorbid generalized social phobia and depression had been unable to go to school or work for more than two days in the past month because of their social phobia. In addition, a substantial proportion of individuals with comorbid generalized (43.2%) and non-generalized (34.3%) social phobia and depression reported significantly diminished work productivity, otherwise comorbid depression did not affect deficiencies of functioning compared to social phobia alone (Wittchen et al 1999). Comorbid depression was not associated with problems at school and in education, life satisfaction or deficiencies in quality of life among individuals with social phobia in a Canadian mixed adolescent and adult general population study with age range of 15-64 years (Stein and Kean 2000).

Comorbid depression increased treatment seeking among adolescents and adults with social phobia (Kessler 2003; Weiller et al 1996; Wittchen et al. 1999). In the EDSP study 27.3% of adolescents with pure generalized social phobia and 43.5% of adolescents with comorbid generalized social phobia and depression sought help (Wittchen et al. 1999). A Finnish general population study reported that concurrent depression increased the treatment seeking of adolescents with social phobia, although it remained unclear whether the social phobia was recognized in the treatment facilities (Ranta et al. 2009). Among adult patients psychological problems as the main reason for health service contact increased from 5.6% of those having social phobia without depression to 61.1% of those having comorbid social phobia and depression (Weiller et al 1996).

2.4.4 Theories on the development of comorbidity between social phobia and depression

A number of hypotheses have been proposed to explain the comorbidity between social phobia and depression. 1) diagnostic explanations: diagnostic boundaries may have so much overlap, that it allows comorbid like syndromes (Angold et al. 1999; Kessler et al 1999; Merikangas et al. 1996), or comorbid disorder pairs may be diagnostic entity itself (Angold et al. 1999), different from either disorder: social phobia and depression could be different manifestations of the same disease across its course (e.g. anxiety is prominent in the early phases, and depression is prominent in the later stages) (Angold et al. 1999; Merikangas et al. 1996; Montgomery 1999) or social phobia and depression may be integrated with each other with changing phenotype during the course of the illness (Angold et al. 1999; Merikangas et al. 1996). 2), epiphenomenal explanations: social phobia may be a causal risk factor for secondary depression (Angold et al. 1999; Kessler et al 1999; Merikangas et al. 1996). This causal effect may be mediated by biological factors, such as anxiety causing hyper-sensitiveness of receptors which alters neurotransmission leading to depression (Merikangas et al. 1996). It could be mediated by psychosocial factors: demoralization leading to depression could be a psychological response to impairment induced by chronic anxiety or social phobia may lead to psychological and functional regression and this causes subsequent depression (Kessler et al 1999; Merikangas et al. 1996). Comorbidity could be consequence of treatment: depression could be a side-effect of drug treatment for anxiety (Merikangas et al. 1996). 3), social phobia and mood disorders may both be consequences of the same shared cause(s) (Angold et al. 1999; Kessler et al 1999; Merikangas et al. 1996).

Different hypotheses may hold true for different disorder pairs. Diagnostic explanations may be more likely to be true in homotypic disorder pairs, for example in the case of comorbidity between two anxiety disorders. This seems more unlikely in the case of social phobia and depression, because the respective symptom profiles are quite distinct. However, comorbid social phobia may be a different psychiatric diagnostic syndrome, or a disorder with changing phenotype (Angold et al. 1999). Epiphenomal explanations or shared causes are also possible in such heterotypic disorders as social phobia and depression.

Adolescent mental disorders are often obscure in their symptomatology, and prodromal or early warning signs of subsequent major psychiatric disorders may, for example, mimic anxiety disorders. In the general population based Northern Finland 1986 Birth Cohort (n

= 6274), of those who later developed psychosis 35% reported experiencing difficulties or uncertainty in making contact with others and 30% reported social withdrawal in adolescence (Mäki et al. 2014). These symptoms may mimic social phobia, especially in adolescents' responses to self-report questionnaires.

In summary regarding hypotheses about the causes of comorbidity between social phobia and depression, it could be concluded that there are not enough studies to verify these hypotheses of comorbidity between social phobia and depression. It is important to study possible shared risk factors for social phobia and depression to test hypotheses about shared causes. Likewise, the presence of some mediating factors, biological or psychosocial may confirm the epiphenomal hypothesis of comorbidity between social phobia and depression.

2.5 Risk factors for adolescent psychiatric disorders

Developmental psychopathology expects that a causal factor may have many outcomes, or, on the other hand, several causal factors may lead to the same outcome (Costello et al. 2006). Attempts to link specific adversities to specific adolescent mental health problems have been disappointing (Kessler et al. 2001). A single risk marker may lead to many different outcomes via different pathways. Poverty, lack of attachment to primary caregivers, poor family relationships, maternal depression, poor school achievement and disrupted family structure are psychosocial and developmental risk factors, which certainly predict child and adolescent psychiatric disorders and medical conditions (Costello et al. 2006). Bullying have found to be a risk factor for different psychiatric disorders and daily smoking and alcohol use and violent crimes in a Finnish general population-based psychiatric inpatient follow-up -study using diagnostic interview for defining psychiatric diagnoses (Luukkonen et al. 2010a; Luukkonen et al. 2010b; Luukkonen et al. 2011). Being a bully and being a victim of bullying was associated with later externalizing disorders and being a victim with internalizing disorders (Luukkonen et al. 2010b). Daily smoking and heavy alcohol use were associated with bullying behaviour in both genders and drug use in girls but not in boys (Luukkonen et al. 2010a). In the Northern Finland 1986 Birth Cohort study externalizing problems at age 8 were associated with adolescent substance use disorders while early internalizing problems were not (Miettunen et al. 2014).

Risk factors for child and adolescent psychiatric disorders could be divided into genetic and environmental bio-psychosocial factors. The risk factors reported in the review article

by Kieling et al. (2011) include familial physical and mental health problems as genetic risk factors. Bio-psychosocial environmental risk factors include adolescent pregnancy and consanguinity, high-risk pregnancy, exposure to harmful substances or toxic substance abuse in adolescence as biological environmental risk factors. Psychosocial environmental risk factors include unwanted pregnancy, perinatal maternal mortality, inadequate adaptation to pregnancy or new-born, inadequate child spacing, inadequate prenatal care, inadequacies in nurturing and stimulating qualities of the caregiving environment, and developmental-behavioural problems, exposure to violence, abuse or neglect, problems in the physical or mental health of the child, problems in the family with peers or at school, deficiencies in psychosocial or educational environment, early sexual activity, and risk-taking behaviour (Kieling et al. 2011). Regular cigarette smoking has identified as a risk factor for schizophrenia and depression in adolescent general population and heavy smoking for suicide attempts among adolescent inpatients (Lewinsohn et al. 1998; Riala et al. 2005; Riala et al. 2007).

The division into genetic and environmental risk factors is somewhat artificial, because parental mental disorder, for example, is a genetic risk factor, but also an environmental factor in that it affects the emotional atmosphere in the family (Nomura et al. 2002). Combined genetic and environmental effect is called gene environment interaction. The effects of environmental factors may also transfer without changes in the DNA sequence; this is called epigenetics (Foley et al. 2009; Liyanage et al. 2014).

Risk factors can be divided into early or concurrent risk factors. Early risk factors include genetic background, problems in the physical or mental health of the child and child's family, deficiencies in the early psychosocial or educational environment, and exposure to childhood abuse or neglect. Other risk factors at the preconceptional, pre- or perinatal phases, infancy, early childhood and early school age are likewise early risk factors. Concurrent risk factors include risk factors in adolescence, such as deficiencies in the later psychosocial or educational environment, exposure to harmful substances or toxins, exposure to violence, early sexual debut, risk-taking behaviour, and abuse or neglect in adolescence.

2.5.1 Risk factors for social phobia

Several possible risk factors have been identified for social phobia in prospective longitudinal studies (Wittchen and Fehm 2001). In adult studies risk factors for social

phobia have shown to be parental social phobia, childhood anxiety, insecure and inhibited temperament, aggression difficulties in independence development and low self-esteem, poverty, emotional neglect in childhood, demanding and critical atmosphere in family and school, low education, low mastery, and ongoing difficulties (Acarturk et al.2009; Chartier et al. 1998; Gladstone et al. 2005; Merikangas et al. 2002; Rapee and Spence 2004). New demands during adolescence, including demands of school with lots of pupils have been identified as triggering factors for social phobia (Chartier et al. 1998). In a birth cohort follow-up study increasing anxious/withdrawn behaviour at age 8 was associated with increasing risk of social phobia (Goodwin et al. 2004). In the EDSP study for genetic risk factors social phobia were parental social phobia, other parental anxiety disorders, depression, and alcohol abuse disorders, and environmental risk factors were parental overprotection, rejection and lack of emotional warmth. Parental psychopathology and poor rearing had combined effects as risk factors (Knappe et al. 2009).

Low self-esteem and low social support as risk factors for social phobia are described more detailed in sections 4.5.4 and 4.5.5.

2.5.2 Risk factors for depression

Risk factors for adolescent depression in different studies include parental depression and psychopathology, rumination and anxious/withdrawn behaviour in childhood, poor adjustment in childhood and in adolescence, manifesting, for example, as bullying, dissatisfaction with academic achievement, pubertal timing and status in adolescence, earlier subsyndromal depression, parenting style (over-involvement, early care lacking emotional supportiveness), poor atmosphere at home, parental divorce, having no close friend, having no dating experiences, and problems with the law (Abela and Hankin 2011; Angold et al. 1998; Betts et al. 2009; Conley and Rudolph 2009; Duggal et al. 2001; Goodwin et al. 2004; Kaltiala-Heino et al. 2003; Klomek et al. 2008; Lewinsohn et al.1998; Pelkonen et al. 2008; Seeley et al. 2009; Verstraeten et al. 2009). Difficulties and traumas in early relationships probably cause long lasting effects on neurophysiology which in turn is associated with depression (Nietola and Korkeila 2013).

In the EDSP study the genetic risk factor for adolescent depression was parental history of mental disorders at baseline. Environmental risk factors were poor intimate relationships, perinatal risk factors, life events/chronic difficulties and also female gender was a risk factor (Wittchen et al. 2000). In the OADP risk factors for adolescent major

depression were internalizing problems, subsyndromal depression, past history of depression or suicide attempt, and presence of a non-affective disorder. Cigarette smoking and physical illness were also risk factors for depression (Lewinsohn et al. 1998). In a longitudinal general population study among adolescent girls the most potent predictors for onset of major depression were environmental risk factors such as poor school and family functioning, low parental support, and delinquency, or earlier mental health symptomatology including sub-threshold depressive symptoms, and bulimic symptoms (Seeley et al. 2009). There are some reports of differences in risk factors for childhood onset depression (maternal depression, early care lacking supportiveness, abuse and family stressors) and adolescent onset depression (maternal depression, early care lacking supportiveness) (Duggal et al. 2001). A 20-item questionnaire (Chigaco adolescent risk assessment) has been developed for screening risk for depression (Nuotio et al. 2013).

Low self-esteem and low social support as risk factors for depression are described more detailed in sections 4.5.4 and 4.5.5.

2.5.3 Risk factors for comorbidity of social phobia and depression

A shared (common, correlate) risk factor is a risk factor for two associated disorders, which explains the association of these disorders. Merikangas et al (1996) proposed several possible domains of shared risk factors for anxiety and depression: biological environmental risk factors (e.g. birth control pills or other drugs such as antihypertensives, viral infection or a nutritional factor); common gene(s) (e.g. a gene involved in dopamine metabolism), exposure to a prenatal environmental factor (e.g. maternal alcohol abuse); or a non-biological environmental factor (e.g. a disruptive family environment associated with an alcoholic parent or parental abuse or neglect). Merikangas et al (1996) hypothesized that exposure to additional risk factors, differential timing of exposure to a particular risk factor, or an environmental condition such as lack of social support or a chronically stressful environment could be causes leading to disparate phenotypes of the disorder (Merikangas et al. 1996).

Studies on adult populations with social phobia on risk factors for comorbid depression have focused on the clinical picture of social phobia. Risk factors for subsequent depression have been found to be early onset, severe and widespread fears and serious symptoms of preceding social phobia (Eng et al. 2000; Keller 2003; Kessler et al.1998; Manuzza et al. 1995; Merikangas et al. 2002; Wittchen and Fehm 2003). Studies on

adolescent general populations rarely report risk factors for comorbidity. In MOAFTS a shared genetic risk for social phobia and depression was found (Nelson et al. 2000). In the EDSP study further comorbidity of another anxiety disorder enhanced the odds ratio for comorbidity between social phobia and depression from 2.2 to 5.5, but there was no change in risk if there was a comorbid disorder other than anxiety disorder (Bittner et al. 2004). In a clinical study conducted in general outpatient paediatric practice, the elevated risk for subsequent depression was significant only in the generalized type of social phobia (Chavira et al. 2004).

2.5.4 Low self-esteem as a risk factor for social phobia and depression

Rosenberg (1965) defines self-esteem as the direction of self-attitude, favourable or unfavourable opinion of self. This attitude to oneself includes facts, opinions and values with regard to the self. It also includes orientation toward the self. Our attitudes towards ourselves are very importantly influenced by the responses of others towards us (Rosenberg 1965).

According to Rosenberg (1965) high self-esteem expresses the feeling that one is “good enough”. The individual considers him- or herself to be a person of worth, and respects him- or herself for what he or she is. An individual with high self-esteem considers him- or herself definitely not worse, but also not necessarily better than others. He or she recognizes his or her limitations and expects to grow and improve, and does not feel that he or she is perfect. Low self-esteem, in turn, implies self-rejection, self-dissatisfaction, self-contempt and lack of respect for the self the individual observes. The self-picture of individual with low self-esteem is disagreeable, and he or she wishes it were otherwise (Rosenberg 1965). Self-esteem has been divided into global and specific (for example academic self-esteem). Enhancing specific, academic self-esteem results in better school performance, and better school marks enhances global self-esteem (Rosenberg et al. 1995).

At age 15-18 adolescents tend to be preoccupied with their self-image (Rosenberg 1965). Global self-esteem is stable during adolescence and increases slightly (Harter et al. 1998). In early adolescence there is more fluctuation in self-esteem, but it becomes more stable with age (Alsaker and Olweus 1993). Self-worth is highly heritable, with little evidence of environmental influence (McGuire et al. 1994). In Rosenberg’s original study of self-esteem measured by the Rosenberg Self-Esteem Scale (RSES) among 5,024 high school

students he found a significant inverse correlation between self-esteem and the number of psychosomatic symptoms (Rosenberg 1965).

There are many commonalities in the features of a person with low self-esteem and of adolescents with social phobia. People with low self-esteem are more likely to be sensitive to criticism, to be deeply disturbed when they are laughed at, scolded, blamed or criticized. They are much more likely to be bothered if others have a poor opinion of them (Rosenberg 1965). Based on this, it is very likely that low self-esteem and social phobia are closely linked to each other. Low self-esteem was found to be associated with anxiety disorders in Rosenberg's study as early as in 1965. According to this, and also to studies on the cognitive theories of social phobia (Alden and Mellings 2004; Alfano et al. 2006; Alfano et al. 2008; Hoffman 2007) one could assume low self-esteem to have a central role in the development of social phobia in adolescence. However, there seems to be a lack of adolescent studies on the association between self-esteem and social phobia. In studies among young adults low self-esteem correlated with social phobia and shyness (Izgc et al. 2004; Koydemir and Demir 2008). Low self-esteem was found to be among the risk-indicators for social phobia in one adult general population study (Acarturk et al. 2009), and in an adult retrospective study (Chartier et al. 1998).

Rosenberg's study (1965) already reported a significant association between self-esteem and depression (Rosenberg 1965). Since then low self-esteem has been reported in many studies to be a risk factor for depression (Eberhart et al. 2006; Lewinsohn et al. 1997a; Lin et al. 2008; Orth et al. 2008). In a general population study on 12-13 year-olds self-esteem emerged as the strongest predictor of depression in both genders (MacPhee and Andrews. 2006). In a study on adolescents and young adults low self-esteem predicted depression but depression did not predict subsequent levels of self-esteem (Orth et al. 2008). In a Finnish general population study low self-esteem at age 16 was an indicator of vulnerability to depression in young adulthood irrespective to family background or gender (Palosaari et al. 1996). High self-esteem has been shown to be a protective factor against depression in several adolescent general population studies (Costello et al. 2008; Facio and Batistuta 2001; Piko and Fitzpatrick. 2003; Van Voorhees et al. 2008).

In a study on mixed adolescent-adult general population neuroticism and self-esteem were the most powerful variables that distinguished subjects with comorbid depression (any comorbidity) from subjects with non-comorbid depression (Schmitz et al. 2003). Adolescent studies on low self-esteem as a risk factor for comorbid social phobia and

depression or on the role of change of self-esteem in the development of comorbid social phobia and depression are lacking.

2.5.5 Low social support as a risk factor for social phobia and depression

Poor social support has been widely studied as a risk factor for adolescent psychiatric problems (Aseltine et al. 1994; Ezzell et al. 2000; La Greca and Lopez 1998; Rao et al. 2010; Ritakallio et al. 2010; Rueger et al. 2010; Schraedley et al. 1999; Seeley et al. 2009; Sheeber et al. 1997; Tuisku et al. 2009; Uddin et al. 2010). In the original study by Blumenthal et al. (1987) using the Perceived Social Support Scale among adults, the likelihood of coronary artery disease was inversely related to the level of social support for type A but not type B behavioural pattern. Social support moderated the long-term health consequences of type A behaviour pattern (Blumenthal et al. 1987). Parental support and monitoring have been found to be significant predictors of identity achievement in adolescent development across age and gender (Sartor and Youniss 2002). As social networks could be positive or negative, the interaction with social network may directly produce positive or negative psychological states (Kawachi and Berkman 2001). Thus, social network may be supportive or deprivation.

Throughout the course of adolescent development adolescents turn emotionally to peers instead of their family (King 2002). Children aged 6-14 have rated families as the strongest source of support followed by peers and teachers (Ezzell et al. 2000). Among high-risk children in a prospective study from 1st grade to 10th grade most common support provider was the biological father followed by grandparents and others (Appleyard et al. 2007). As children grow older, their perceptions of source of support have reported to turn from family to peers (Garnefski 2000).

Adolescent studies on the association between social support and social phobia in particular are scarce. Only few studies have been conducted among adolescents; two of these were cross-sectional (La Greca and Lopez 1998; Erath et al. 2007) and one was longitudinal (McDonald et al. 2010). In these studies adolescents with social anxiety have been reported to have decreased peer acceptance, increased peer victimization (Erath et al. 2007) and less support from classmates and less social acceptance (La Greca and Lopez 1998). Perceived social support from family and teachers has not been found to be cross-sectionally associated with social phobia (La Greca and Lopez 1998), but low social

support from friends was associated with social phobia in the longitudinal study by McDonald et al. (2010).

On the other hand, low social support has been widely studied and reported to be a risk factor for adolescent depression (Bettge et al. 2008; Kaltiala-Heino et al. 2001; Lewinsohn et al. 1997a; Newman et al. 2007; Schraedley et al. 1999). High social support, in turn, has been found to have a buffering effect on the emergence of depression (Denny et al. 2004; Piko et al. 2009). The findings of adolescent studies on the effects of support from different sources are somewhat inconsistent. Talking to parents has been reported to be especially helpful in preventing depressive symptoms (Schraedley et al. 1999). Similarly, both family and peer support have been shown in most studies to be linked to depression (Denny et al. 2004; McDonald et al. 2010; Moscardino et al. 2010; Newman et al. 2007; Ritakallio et al. 2010; Seeley et al. 2009; Vaughan et al. 2010). However, in the OADP low social support from friends but not from family was associated with depression (Lewinsohn et al. 1997a). In a study on adolescent girls with eating disorders high parental support did likewise not buffer adolescent girls with bulimic symptoms from developing future major depression (Seeley et al. 2009). School related support has been reported to play only a minimal role in relation to depression (Piko et al. 2009). In a study on young adolescents (mean age 13) peer support was not associated with subsequent depression (Stice et al. 2004).

Decreased risk for depression among adolescents has been shown to be linked especially to perceived support and not enacted support (Cheng 1998). Perceptions of helpful social support have found to differ among never-depressed adults and depressed adults; never-depressed persons considered activation-oriented support to be helpful and depressed persons considered protection-oriented support to be helpful (Vollman et al. 2010).

Rao et al. (2010) explored the association of physical markers of stress and depression and social support among adolescents. That study showed that higher cortisol levels were associated with longer duration of the initial depressive episode. This effect was moderated by perceived (but not enacted) social support. Furthermore, a combination of elevated cortisol levels and recent stressful experiences predicted recurrence, whereas a higher level of perceived (but not enacted) social support was protective against the effect of hypothalamus-pituitary-adrenal (HPA) activity on recurrence (Rao et al. 2010).

The association between social phobia and depression and perceived social support seems to be bidirectional. Social phobia was shown to have negative impact on social support in

an adult study (Cramer et al. 2005). Depression was shown to predict future decrease in peer support but not in parental support in a study among early adolescents (Stice et al. 2004). In an adolescent general population study, adolescent depression likewise did not predict deterioration in family relationships (Sheeber et al. 1997).

2.6 Gender differences in adolescence

2.6.1 Gender differences in physical development

Girls have their menarche on average at age 12-13, one to two years earlier than boys have their semenarche (King 2002). As adolescence begins at puberty, girls reach adolescence earlier than boys. In some studies abnormal timing of puberty has been found to affect girls and boys differently early puberty being distressing for girls (Ge et al. 2001) and late puberty for boys (Petersen 1998). However, early pubertal maturation has been found to be associated with mental health problems among both girls and boys (Kaltiala-Heino et al. 2003). As one of the main tasks in adolescent development is to establish a sexual identity, the development manifests differently among girls and boys (Laufer and Laufer 1984). Adolescence is characterized by a marked bodily change. Among girls this change is even more pronounced than among boys. Among girls, normal increase in body adipose tissue is distressing while among boys, increasing muscularity is a desirable change (Jones 2004). Peer groups in adolescence are essential in the development of female or male identity and in the separation process from parents. Girls have been found to be more relationship-oriented, and more concerned about others' opinions of themselves in peer groups than boys (Gavin et al. 1989).

2.6.2 Gender differences in the development of the brain

The most consistent sex difference in brain morphometry is the 9–12% larger brain size that has been reported in males in childhood, adolescence and adulthood (Lenroot and Giedd al. 2010). There seem to be interactions between puberty hormones and the development of the brain. Brain volume peaks in girls at the age of 10.5 years and in boys at the age of 14.5 years (Hedman et al. 2012; Lenroot and Giedd al. 2010). White matter volumes increase more rapidly among males than females (Lenroot and Giedd al. 2010). In girls peak grey matter volume in the frontal and parietal lobes is reached at around the

age of 11 years and in boys at age 12 years (Hedman et al. 2012). There are also many gender differences in grey matter volume in many parts of the brain in adolescence, which are accentuated during puberty (Blakemore 2012). For example, the caudate has been reported to be proportionately larger in females, and larger size or more rapid growth of the hippocampus has typically been reported in females, and of the amygdala in males (Lenroot and Giedd al. 2010). The volume of the white matter and thickness of the Corpus Callosum also develop earlier in girls than in boys (Ladouceur et al. 2012). These areas have also been associated with disorders such as depression and anxiety, which show differences between genders (Lenroot and Giedd al. 2010).

2.6.3 Gender differences in the epidemiology of psychiatric disorders and in comorbidity

With the transition from childhood to adolescence there is also a shift in the prevalence of mental disorders from male predominance to female predominance. Most childhood onset disorders are more common among males than among females, whereas most adolescent disorders are more common among females. During childhood and early adolescence attention deficit disorders and conduct disorders are the most common disorders, and more prevalent among boys than girls. From middle adolescence onwards depressive disorders and anxiety disorders become more prevalent, especially among girls and thus mental disorders become more prevalent among girls than among boys (Costello et al. 2011). In adolescent psychiatric disorders overall, major depression, panic disorder, social phobia and eating disorders are more common among females, while conduct disorders and substance abuse disorders are more prevalent among males (Costello et al. 2006).

Heterotypic continuity has been found to be more common among girls than boys. In the GSMS concurrent comorbidity and homotypic and heterotypic continuity were more marked in girls than in boys. Anxiety predicted depression and vice versa, even controlling for current comorbidity among girls but not among boys. Links between former anxiety and subsequent substance abuse disorder were true only among girls (Costello et al. 2003; Costello et al. 2006).

2.6.4 Gender differences in social phobia and depression

The prevalence of social phobia has in many studies been found to be higher among adolescent females than males (Dell'osso et al. 2002; Gren-Landell et al. 2009; La Greca and Lopez 1998; Shields 2004; Wittchen et al. 1999). In a Finnish study, however, the female to male ratio was 0.7 to 1 in 12-14 year-olds and changed to 1.5 to 1 in 15-17 year-olds (Ranta et al. 2009). Depression is more common among female than among male adolescents (Hankin 2009). In the NCS-A unipolar depression was nearly twice as common among females (15.9%) than among males (7.7%) (Merikangas et al. 2010). Female predominance in the prevalence of depression emerges during adolescence (Ge et al. 2001; Hankin and Abrahamson 1999; Kessler et al. 2001; Nolen-Hoeksema and Girgus 1994). In the GSMS the transition to adolescence was marked by a rise in rates of depression and social phobia among girls but not among boys (Costello et al. 2003). It has also been speculated that gender differences in depression may hold true only in adolescent-onset depression, not adult-onset depression; the female predominance in the prevalence of depression being a specific phenomenon of adolescence (Kessler et al. 1993). In the OADP girls more often reported weight/appetite disturbance and feelings of worthlessness/guilt than did boys as symptoms of depression (Lewinsohn et al. 1998). In adult studies prevalence rates in both social phobia and depression are higher among females than among males (Suvisaari 2013).

In a Canadian mixed adolescent-adult study family environment had different impacts as a risk factor for social phobia in females and males. Risk factors for females only were parental conflict while growing up, childhood physical abuse by a father figure and maternal mania. Risk factors reported for males only were absence of a parent or other adult close confidant during childhood (DeWit et al. 2005). Social anxiety has also been found to be more closely linked to girls' social functioning than boys (La Greca and Lopez 1998). In a Finnish study risk factors predicting depression for females were more internalizing and for males more externalizing. In multivariate analyses among females symptoms of depression at baseline, low self-esteem and dissatisfaction with academic achievements were associated with subsequent depression, while among males symptoms of depression at baseline, problems with the law, having no friends and poor atmosphere at home, but not low self-esteem, predicted later depression (Pelkonen et al. 2003). Gender differences have been found in family related risk factors, too. Among girls maternal depression has been found to be strongly associated with depression and among boys early care lacking in supportiveness has been found to be relevant (Duggal et al. 2001). Earlier puberty, actual or perceived among girls, but less mature puberty status

among boys have been linked to depression (Conley and Rudolph 2009), yet not in all studies (Kaltiala-Heino et al. 2003). In the GSMS pubertal maturity affected girls and boys differently regardless of the timing of puberty: after pubertal maturation the prevalence of depression increased among girls, while among boys the prevalence of depression decreased (Angold et al. 1998).

In the OADP among adolescents with major depressive disorder gender had a significant main effect in predicting psychopathology at age 19-24. Being female increased the likelihood of future major depressive disorder and adjustment disorder, while being male increased the likelihood of future non-affective disorders, axis II disorders and elevated antisocial personality dimensional scores (Lewinsohn et al. 1999). An adult study reported that among those suffering from social phobia, comorbid major depressive disorders were equally prevalent in both sexes, even though depression itself is twice as common in women as in men (Yonkers et al. 2001).

2.6.5 Gender differences in self-esteem

Boys have been reported in a number of studies to have higher self-esteem than girls (Dukes and Martinez 1994; Kling et al. 1999; McClure et al. 2010). In a Finnish twin study there was a gender difference in the development of self-esteem in middle adolescence: compared to girls, boys' scores were higher at age 14 and exhibited a slight growth pattern, whereas girls' scores did not follow any consistent pattern (Raevuori et al. 2007).

In his original study, Rosenberg (1965) reported gender differences in attributions linked to self-esteem. Girls gave more priority than boys to being well-liked by others, and girls stressed more interpersonal harmony and tender virtues, moral virtues and aesthetic appreciation (Rosenberg 1965). Boys stressed more motoric values and physical courage (interpersonal control or dominance) in their relationships with others. Hard-headedness or freedom from naïveté is also more of a male value. Boys appear to place greater emphasis on being versatile, they are more likely to care about being “good at many different things” and about being “a person who knows quite a bit about many different things” (Rosenberg 1965).

Body image is more often associated with low self-esteem and depression among girls than among boys (Hankin et al. 1998). Body mass index has been found to affect female self-esteem most at ages 15 and 16 (Biro et al. 2006). It has been hypothesized that body

image and self-esteem are the main contributors to depression which differentiate girls from boys (Algood-Merten et al. 1990). Body dissatisfaction has been found to be a predictor of depressive mood and low self-esteem in early adolescent girls and mid-adolescent boys, but not in early adolescent boys or mid-adolescent girls (Paxton et al. 2006). A general population study among adolescents aged 13-18 showed that controlling for body image removed the gender difference of girls having lower self-esteem and being more depressed (Siegel et al. 1999). Appearance has been postulated to be most important for overall self-esteem, especially among girls (Usmiani and Daniluk 1997) and the most important variables in reducing sex difference in prevalence of depression were improving body image and self-esteem in females (Algood-Merten et al. 1990).

Pubertal maturation affects self-esteem differently among girls and boys. Girls with early pubertal maturation have poorer self-image than their peers (Ge et al. 2001), while boys with late pubertal maturation have relatively poorer self-esteem and stronger feelings of inadequacy than early maturing boys (Petersen 1998).

There are some studies that point out that self-esteem may be a risk factor for depression among girls, but not among boys (Canals et al. 2002; Eberhart et al. 2006; Facio and Batistuta 2001; Palosaari et al. 1996; Pelkonen et al. 2003). It has been reported that global self-worth significantly mediated the relationship between sex and depression in adolescent general population studies (Eberhart et al. 2006). On the other hand, there are also findings that self-esteem is a strong risk factor for depression in both sexes (MacPhee and Andrews 2006; Orth et al. 2008).

2.6.6 Gender differences in social support

In adult studies women tend to maintain more emotionally intimate relationships, mobilize more social support during periods of stress and provide more frequent and more effective social support to others (Kawachi and Berkman 2001). Likewise in adolescent studies females report higher levels of perceived social support (Bruwer et al. 2008; Schraedley et al. 1999; Valery and Connor 1997).

It has been reported that there are no gender differences in perceived family support, but girls perceive more support from peers and other sources (Burke and Weir 1978; Katainen et al. 1999; La Greca and Lopez. 1998; Newman et al. 2007; Rueger et al. 2010). In an early study of adolescents aged 13-20 no gender differences were found in perceived social

support from mother or father (Burke and Weir 1978). Females felt free to discuss a more extensive array of problems with their peers. Females disclose their negative experiences to mothers and peers more readily than do males. Females were more satisfied with the help they received from their friends. Males named fathers as first choice as helpers while females named same-sex peers (Burke and Weir 1978). In a Finnish prospective adolescent study on adolescents aged 15, girls reported higher levels of support from friends and significant others than did boys (Katainen et al. 1999).

Parental support seems to have different impacts on adolescent development among girls and boys. Low social support has been shown to have a more deleterious effect on social functioning among girls than boys (La Greca and Lopez 1998). On the other hand, the association between parental support and identity development has been shown to be stronger among boys than girls (Sartor and Youniss 2002).

In a general population study on adolescent social phobia, girls who had fewer friendships and perceived less intimacy, companionship and support in their close friendships suffered more often from social phobia, but boys' friendships were generally not significantly related to social phobia. For girls lack of both close friendships and peer acceptance were significantly associated with social anxiety. For boys, lack of peer acceptance was consistently associated with social anxiety, but lack close friendships were not when peer acceptance was considered (La Greca and Lopez 1998).

Stress and social support have been reported in some studies to be more strongly associated with depression among girls than boys in some studies (Kaltiala-Heino et al. 2001; Schraedley et al. 1999), but not in all (Denny et al. 2004). Maternal support has been shown to buffer against depression more strongly in girls than in boys (Vaughan et al. 2010), and low support from friends has been found to be associated with depression after traumatic experience only among girls (Moscardino et al. 2010).

An adolescent study on substance abuse reported that more perceived social support from teachers, and to a lesser extent from parents, was associated with less substance abuse among boys, among girls more support from peers was consistently associated with more substance abuse (Lifrak et al. 1997).

2.7 Summary of the literature

Social phobia and depression are common disorders in adolescence. They both have a chronic course, causing a great deal of disability and functional impairment in many areas. Comorbidity between social phobia and depression is common, indicating a special association between these two disorders.

Comorbidity is an important research area in child and adolescent psychiatry, since understanding how comorbidity arises gives more understanding on the development of psychopathology (Angold et al. 1998). Self-esteem and perceived social support are psychosocial factors with a marked effect on adolescent development. Although there is only limited evidence of a link between self-esteem and perceived social support with adolescent social phobia, they may be considered as strong candidates in being associated in the development of comorbid social phobia and depression. There is virtually no research on self-esteem and perceived social support as factors affecting the association between social phobia and depression in adolescents.

There are a number of shortcomings concerning earlier studies about the development of comorbidity of social phobia and depression, and risk factors of social phobia, depression and their comorbidity. Studies are often cross-sectional, which precludes causal interpretations. In many studies the emergence of disorders has been retrospectively traced back, and there is a risk of recall-bias in these so differently emerging disorders. Social phobia emerges in many cases quite abruptly when a person is faced with a critical or challenging situation (Wittchen and Fehm 2003), while depression emerges more gradually as a long process, (Lewinsohn et al. 1998). Thus it may be easier to define and trace back the beginning of social phobia than of depression. Studies should be designed as prospective, and conducted close to the time of the emergence of social phobia and depression.

One major caveat in epidemiological studies of risk factors is the choice of covariates to be controlled for. Although self-report studies may cover quite many relevant issues, study designers always must exclude some aspects. Moreover, there is only a limited amount of data that is reasonable to analyse. In this field there are shortcomings in many studies. For example, many studies have not reported results separately for boys and girls. Also, when studying social support and self-esteem as risk factors for depression, social phobia at baseline has not been controlled for, or vice versa. Social phobia may affect self-esteem and perceived social support and is also associated with depression. Thus social phobia

should be controlled for when the associations between self-esteem or social support and depression are studied. The same holds true for depression when risk factors for social phobia are studied. Controlling of externalizing disorders is seldom done in studies on internalizing disorders. However, this should be done, because internalizing disorders are also comorbid with externalizing disorders (Costello et al. 2008) and this may affect the development of and the associations between internalizing disorders.

In recent years good prospective adolescent general population studies of comorbidity of social phobia and depression have been published. However, they often have the above mentioned shortcomings. Despite these studies, there are still major gaps in our knowledge about adolescent social phobia and depression, and on the association between them. Our knowledge of the psychosocial factors associated with the development and comorbidity of these disorders and gender-specific differences therein is limited.

3 Aims of the study

The present study was designed to fill the gaps in what is known about the development and associations of social phobia, depression and two selected psychosocial factors, self-esteem and perceived social support.

The specific aims to study were to ascertain, separately in adolescent boys and girls:

- If there is an association between social phobia without depression at age 15 years and depression at age 17 years (Study I).
- If there is an association between depression without social phobia at age 15 years and social phobia at age 17 years (Study I).
- If low self-esteem at age 15 years could be used as a risk marker for social phobia and depression at age 17 years (Study II).
- If decrease in self-esteem between ages 15 and 17 years mediates the association between social phobia and depression or vice versa (Study III).
- If low perceived social support at age 15 years is associated with social phobia, depression and comorbid social phobia and depression at age 17 years (Study IV).

4 Materials and methods

4.1 Study design and data collection

The present study is part of the ongoing prospective cohort study, The Adolescent Mental Health Cohort (AMHC). The AMHC study is a large epidemiological survey conducted in two Finnish cities, Tampere (200,000 inhabitants) and Vantaa (180,000 inhabitants). The AMHC study is intended to examine a wide range of issues linked to adolescent mental health in general population. The present study concerns the two-year follow-up between ages 15 and 17 years, from the beginning to the end of the middle adolescence.

For data collection a school survey was arranged in all of the ninth grades of all Finnish-speaking secondary schools in Tampere and Vantaa 2002-2003 (T1). During a school lesson, under the supervision of a teacher, all students completed a person-identifiable questionnaire (Appendix 1). Another opportunity to participate was offered in the school within a couple of weeks for students absent from school on the original survey day. For students not present on either occasion the questionnaires were sent by post twice. If no reply was received, it was concluded that the student declined to participate. The total number of students in the ninth grades of the participating schools was 3809. Response rate at T1 was 94.4% (96% in Tampere and 92% in Vantaa). From the final sample 531 (14%) respondents were excluded because of being younger than 15 years, obvious facetiousness, or too many incomplete responses. The final baseline sample consisted of 1,609 girls and 1,669 boys. The mean age of the participants was 15.5 years (sd 0.39). More than two thirds (69%) of the respondents lived in two-parent families. The distribution of the respondents' parents' highest educational qualification was (father / mother): 16% / 13% comprehensive school only, 40% / 30% comprehensive school and vocational school, 17% / 31% college with or without vocational school, and 28% / 26% university degree.

Eligible participants at follow-up (T2) (2004-2005) were subjects who had participated at T1. School-based surveys like that at T1 (identical to Appendix 1) were organized in upper secondary schools and vocational schools. Adolescents not reached through schools were contacted by postal survey. For those who did not respond via their schools or by post,

the survey was offered by Internet. If no response was received even via Internet, the subject was concluded to be unwilling to participate.

The subjects of the present study were the 2,070 adolescents responding to both surveys at T1 and T2. The response rate of the final sample was 63.1% (2070 / 3278). Of the respondents 56.6% were girls. The mean age of the subjects at T2 was 17.6 years (sd 0.4). Nine out of ten (89.6%) of the girls and eight out of ten (82.0%) of the boys were full-time students at T2 (gender difference $p < 0.001$). Subjects answering too incompletely (more than three items missing) to the measures for social phobia or depression ($N=32$) were excluded from analyses, and the final sample consisted of 2,038 subjects, 1,154 girls and 884 boys. In the various analyses of the present study all data available were used, and therefore the number of subjects varies slightly in separate analyses. (Figure 3).

4.2 Ethical considerations

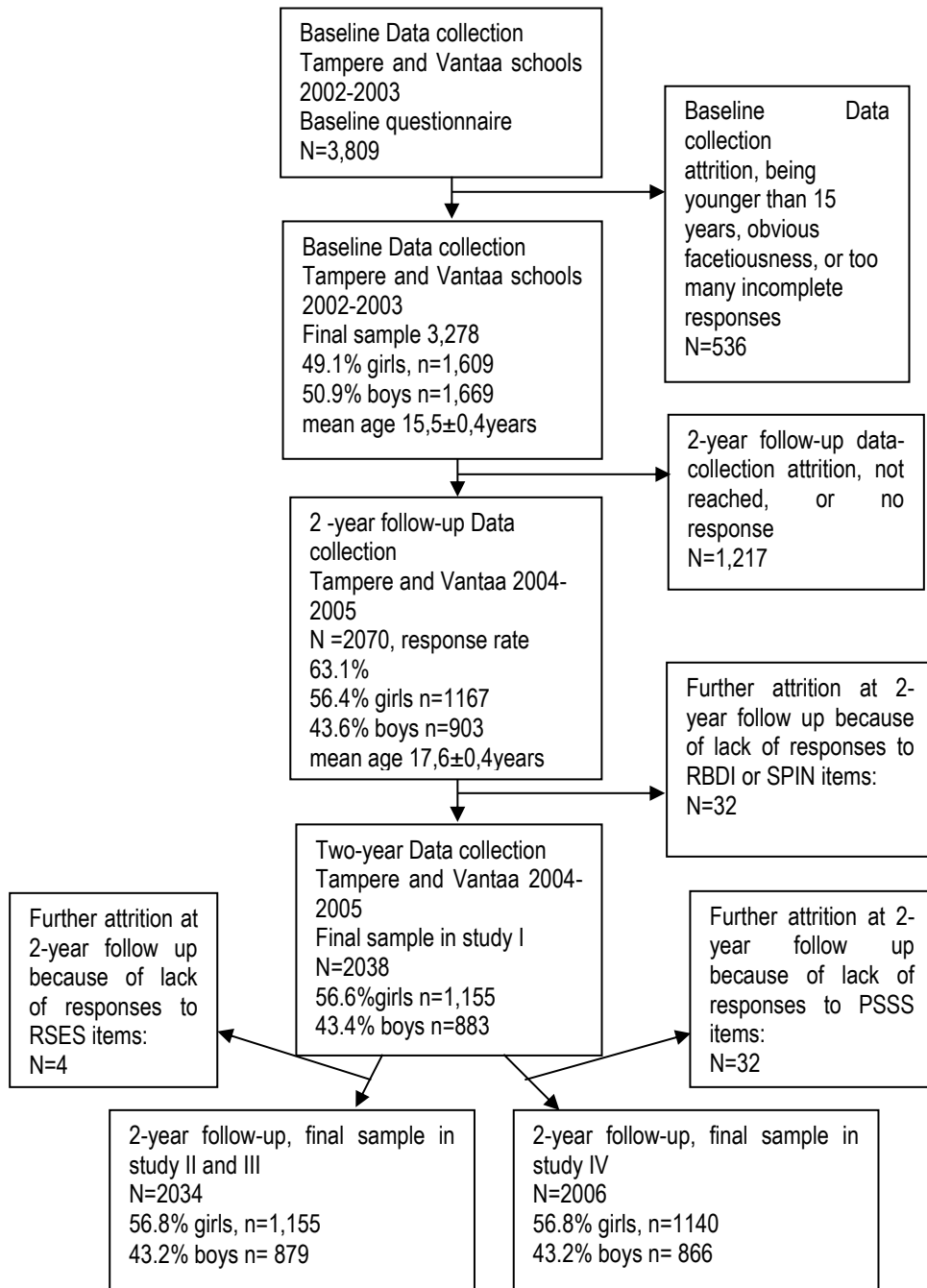
This study was approved by the Pirkanmaa Hospital District Ethics Committee, and by the Tampere and Vantaa Research Approval Boards. The Finnish legislation on medical research allows subjects aged 15 years and older to consent alone. Thus parental consent for participation was not required, but the parents of the subjects were informed in advance by letter.

4.3 Attrition

There were more boys than girls among non-responders at T2; 63.4% of the non-responders were boys and 36.6% were girls ($p < 0.001$). Non-responders had more often depression than responders (non-responders 11.7% vs. responders 9.1%, $p = 0.022$). There was no difference in the prevalence of social phobia between non-responders and responders (non-responders 9.1% vs. responders 8.4%, $p = 0.523$). Perceived support from family at T1 was significantly lower among drop-out boys than among boys who also responded at T2 (Mann-Whitney $-$ test, $p = 0.015$). Other social support variables did not differ significantly between responders and drop-outs. Attrition was not associated with self-esteem (non-responders' mean score 29.6 vs responders' mean score 29.7 on the Rosenberg Self-Esteem Scale (RSES) $p = 0.710$). A multivariate analysis revealed a significant multivariate effect of self-esteem, depressive symptoms, and social anxiety on attrition ($F(3, 3179) = 4.57, p < .01, \eta^2p = .004$) with somewhat higher levels of social

anxiety among those participating at both time points ($F(1, 3181) = 4.34, p < .05, \eta^2p = .001$). Both parents' highest educational qualification was more often comprehensive school only among non-responders at T2 (father: non-responders 18.9% vs. responders 15.1% $p=0.005$, mother: non-responders 16.1% vs. responders 12.2%, $p=0.002$). Not living with both biological parents was also more common among dropouts (non-responders 35.2% vs. responders 27.5% $p<0.001$) (Figure 3)

Figure 3. Flow chart of the course of the study



4.4 Measures

Self-reported questionnaires were used to evaluate social phobia and depression symptoms, self-esteem and social support reported by adolescents.

4.4.1 Background

A questionnaire covering a wide range of issues about the psychosocial background of the subjects was constructed for the AMHC study. Issues of interest in the present study were age, family structure and both parents' highest educational qualification. (Appendix 1).

Age was calculated from the date of birth to the date of the survey. (Appendix 1, item 2).

Subjects were instructed to select one of the items on the question: 'does your family include?' Items to select were: mother and father; mother and stepfather; father and stepmother, only mother; only father; some other caregiver, who? For the present study responses were dichotomized to: living with both biological parents (if the first item was selected) / living in any other kind of family structure (if one of the other items was selected). (Appendix 1, item 96). Subjects were instructed to select one of the items on questions: 'what is the highest educational qualification your father has completed?' / 'what is the highest educational qualification your mother has completed?' Items to select were: comprehensive school only, comprehensive school and vocational school, college with or without vocational school, university degree. For the present study answers were dichotomized to comprehensive school only, if the first item was selected / higher education, if some of the other items was selected. (Appendix 1, items 98-99).

4.4.2 Social phobia (SP)

To measure symptomatology of social phobia (SP) the Social Phobia Inventory (SPIN, Appendix 1, items 33-49) was used (Connor et al. 2000). SPIN is 17-item self-report questionnaire for measuring symptoms of social phobia. It is constructed on a five-point Likert-type scale. SPIN has previously shown good reliability and construct validity for use in adolescent general population studies (Johnson et al. 2006; Ranta et al. 2007). For the Finnish translation of SPIN, the cut-off of 24 points has yielded 81.8% sensitivity and 85.1% specificity in relation to diagnoses made by the semi-structured Schedules for

Affective Disorders and Schizophrenia for school-aged children – Present and Lifetime version (K-SADS-PL) (Ranta et al. 2007). Thus, the cut-off of 24 points was used to identify participants with SP.

4.4.3 Depression (DEP)

The Finnish translation of the 13-item Beck Depression Inventory (BDI-13, Appendix 1, items 19-32) (Raitasalo 2007) was used to assess symptomatology of depression (DEP) (Beck and Beck 1972; Beck et al. 1974). The BDI-13 is a widely used self-report scale measuring the severity of depressive symptoms with good reliability and validity among adolescents in clinical settings (Bennett et al. 1997). The BDI-13 has been shown to be an appropriate measurement for depression among Finnish adolescents in general population studies (Kaltiala-Heino et al. 1999; Raitasalo 2007). Each item is scored 0-3 according to the severity of the symptom. Sum scores of 13 items (range 0-39) were dichotomised to no/mild depression (scores 0-7), and moderate/severe depression (scores 8-39) (Beck and Beck 1972). A cut-off of 8 points predicts a diagnosis of adult depression made by the semi-structured diagnostic interview Schedules for Clinical Assessment in Neuropsychiatry (SCAN) with good sensitivity (0.93) and specificity (0.88) (Fountoulakis et al. 2003).

4.4.4 Self-esteem (SE)

Self-esteem (SE) was measured by the Finnish translation of the Rosenberg Self-Esteem Scale (RSES, Appendix 1, item 107) (Rosenberg 1965). The RSES is a self-report scale measuring global SE. The RSES is especially designed for adolescents. It consists of 10 statements, five statements reflecting high SE (e.g. 'I feel that I am a person of worth, at least on an equal plane with others') and five statements reflecting low SE (e.g. 'I feel I do not have much to be proud of'). In each item participants are asked to indicate their agreement to statements on a four-point scale (from strongly agree to strongly disagree). Responses to the statements reflecting high SE were scored from strongly disagree =1 to strongly agree =4 on each item. Responses to the statements reflecting low SE were scored from strongly agree =1 to strongly disagree =4 on each item. Total sum scores varied from 10 to 40. High sum scores indicate high SE. In the present study results of the RSES were used either as continuous sum scores or dichotomized to indicate low SE (scores < 25), and normal SE (scores ≥25) in different analyses. The RSES was originally

tested on a large sample of high-school students and found to have good face validity in adolescent population (Rosenberg 1965). Since then the RSES has been widely used in adolescent studies in many countries (Button et al. 1997; Connor et al. 2004; Orth et al. 2008; Raevuori et al. 2007).

4.4.5 Perceived social support (PSS)

The Perceived Social Support Scale-Revised (PSSS-R, Appendix 1, item 106) was used to measure perceived social support (PSS) from multiple sources. The PSSS-R measures individuals' subjective perceptions of social support and emotional closeness (Blumenthal et al. 1987). The PSSS-R contains 12 items on a 5-point Likert-type scale. Factor-analytically derived sum-scores of the PSSS-R were used to measure PSS from family (four items, e.g. 'I get emotional help and support from my family'), friends (four items, e.g. 'My friends really support me when I need help'), and significant other (four items, e.g. 'There is a special person with whom I can share my joys and sorrows'). For each factor the range of sum scores is 4-20, and the total score of the PSSS-R ranges from 12 to 60. High sum scores indicate high PSS. Continuous sum scores of total scale and of family, friend and significant other subscales of the PSSS-R were used in the present study. The PSSS-R has been shown to be a reliable and valid method in assessing PSS among Finnish adolescents (Katainen et al. 1999).

4.4.6 Other measures

Externalizing behaviour as a covariate was measured by the externalizing scale of the Youth Self Report (YSR) (Achenbach 1991, Appendix 1, item 63). The YSR is a self-report instrument for measuring psychiatric symptoms among adolescents aged 11-18 years. The externalizing scale of the YSR consists of 11 items concerning delinquency and 18 items concerning aggressive behaviour. On the basis of the frequency of externalizing behaviour each item was scored from 0 to 2. The continuous sum score of the externalizing scale of the YSR was used in the present study. The YSR has been widely used in adolescent studies and it has shown good reliability and validity (Achenbach 1991; Helstelä and Sourander 2001; Verhulst et al. 2003).

4.5 Missing values

Cases were excluded if more than three items of the measures were unanswered. If three or fewer items were unanswered, missing values were replaced by the mean value of the subject's responses to the other items of the scale.

4.6 Covariates

Covariates controlled for in statistical analyses were age at T1, family structure (living with both biological parents / living in other kind of family structure) at T1, both parents' highest educational qualification (comprehensive school only / higher education) at T1, and externalizing symptoms at T1. These covariates were chosen to be controlled for because according to earlier studies they may have an impact on the issues studied. Age: There are changes in the prevalence of depression and social phobia (Hankin et al. 1998; Wittchen and Fehm 2001), the primary source of perceived social support (Appleyard et al. 2007; Ezzell et al. 2000; Garnefski 2000), and in the self-esteem during adolescence (Connor et al. 2004). Family structure: Family structure has been found to be associated with risk for depression (Kendler et al. 2002; Kendler et al. 2006; Lin et al. 2008; O'Farrel et al. 2005) and social phobia (DeWit et al. 2005). Both parents' highest educational qualification (reflecting socioeconomic status): Family socioeconomic status has been found to be associated with risk for depression (Lin et al. 2008) and social phobia (Wittchen and Fehm 2001) and with self-esteem (Rosenberg 1965). Externalizing behaviour: Delinquent behaviour has been found to be associated with the course of depression (Costello et al. 2008) and in the association between depression and perceived social support (Ritakallio et al. 2010).

4.7 Concepts of comorbidity and heterotypic continuity

In the present study comorbidity refers to the simultaneous occurrence of SP and DEP (concurrent comorbidity). The term heterotypic continuity was used when SP (without DEP) switched to DEP (without SP) or vice versa during follow-up.

4.8 Statistical methods

Four groups were defined at T1 and T2 according to disorder status: subjects with 1) neither SP nor DEP (=neither SP nor DEP, SPIN score <24, BDI-13 score <8), 2) SP without DEP (=SP, SPIN \geq 24, BDI-13 <8), 3) DEP without SP (=DEP, SPIN <24, BDI-13 \geq 8), and 4) both SP and DEP (=comorbid SP and DEP, SPIN \geq 24, BDI-13 \geq 8).

4.8.1 Methods for analysing associations between social phobia and depression (I)

Prevalence rates were calculated as simple frequencies for SP, DEP and comorbid SP and DEP at T1 and T2. Distributions in percentages between non-comorbid disorders and comorbid disorders were also calculated at both time points. Calculations were made separately for girls and boys. The significance of gender differences in prevalence rates as well as changes in prevalence rates between T1 and T2 were tested using Pearson's Chi-square (χ^2) and Fisher's Exact Tests. A P-value <0.05 was used to indicate statistical significance.

The association between SP at T1 and DEP with or without SP at T2 was analysed using logistic regression analysis with all covariates comparing SP -group at T1 to the neither SP nor DEP -group at T1 as independent variables and DEP plus comorbid SP and DEP at T2 as dependent variable. The association between DEP at T1 and SP with or without DEP at T2 was analysed similarly comparing the DEP -group to the neither SP nor DEP -group at T1 as independent variables and SP plus comorbid SP and DEP at T2 as dependent variable. Odds ratios (OR) with 95% confidence intervals (CI) were used to describe the association, with $p < 0.05$ as the level of statistical significance.

4.8.2 Methods for analysing associations between self-esteem and social phobia and depression: Analyses for determining cut-points of RSES (II)

Descriptive statistics for variables are presented as percentages, and differences in distributions on variables were analysed with Chi-square (χ^2) test. Descriptive statistics for continuous data are presented as means (M) \pm standard deviations (sd). Multivariate analysis of variance (MANOVA) was used to analyse group differences. Correlation coefficients were assessed according to the guidelines provided by Cohen (1992).

Between-subjects, within-subjects, and interaction effects of depressive symptoms and social anxiety were assessed by repeated measures MANOVA (double-multivariate design). Results for effect size are presented as test values (F) based on Pillai's Trace, and Partial Eta Square (η^2_p). The sensitivity and specificity of different cut-points for low self-esteem were assessed by receiver operating characteristics (ROC) curve analyses (van Erkel & Pattynama, 1998) and the area under the curve (AUC) was used to test the discriminative power. AUC values were assessed using guidelines provided by Hosmer and Lemeshow (2000).

Descriptive statistics are provided as the means (M) of the RSES measures in the neither SP nor DEP, SP, DEP, and comorbid SP and DEP -groups at T1 and T2 separately for girls and boys. Gender differences in means of the RSES was tested using Mann-Whitney test with p-value of <0.05 for indication of statistical significance. (III).

4.8.3 Methods for analysing associations between self-esteem and social phobia and depression: Self-esteem as a mediating factor (III)

According to Baron and Kenny (1986) an association between two variables (a) and (b) is mediated by a third variable (c) if: 1) there is an association between variable (a) at T1 and variable (b) at T2, 2) variable (a) at T1 is associated with a third variable (c), 3) third variable (c) is associated with variable (b) at T2, and 4) the original association between variables (a) at T1 and (b) at T2 disappears after adding the variable (c) into the analysis. Baron and Kenny (1986) called this perfect mediation. If the association between variables (a) at T1 and (b) at T2 persists but weakens after adding the third variable (c) into the analysis, it was called partial mediation (Baron and Kenny 1986).

Self-esteem as a mediating factor for the association between SP at T1 and DEP plus comorbid SP and DEP (i.e. DEP with or without SP) at T2, and between DEP at T1 and SP plus comorbid SP and DEP (i.e. SP with or without DEP) at T2 was studied by binary logistic regression according to the description of Baron and Kenny (1986). To ascertain the impact of SP or DEP at T1 on SE, a new variable 'change in SE from T1 to T2' was calculated. 'Change in SE from T1 to T2' = [SE at T2 – SE at T1]. If SE increased from T1 to T2 'change in SE from T1 to T2' was positive, and if SE decreased it was negative. (III).

Binary logistic regression where the SP group at T1 versus the neither SP nor DEP group at T1 were independent variables, and DEP with or without SP at T2 was dependent variable was made adding the 'change in SE from T1 to T2' into the analysis. SE at T1 and other covariates were controlled for. Similar logistic regression analysis was performed with the DEP group at T1 versus the neither SP nor DEP at T1 as independent variables and SP with or without DEP at T2 as dependent variable. The associations between SP or DEP at T1 and 'change in SE from T1 to T2' were studied by separate logistic regression analyses. Similarly, the associations between 'change in SE from T1 to T2' and SP with or without DEP at T2 or DEP with or without SP at T2 were studied by separate logistic regression analyses.

The associations between SP at T1 to DEP with or without SP at T2, or that between DEP at T1 to SP with or without DEP at T2, were interpreted to be mediated by 'change in SE from T1 to T2' according to Baron and Kenny's (1986) description.

OR with 95% CI was used to show associations between independent and dependent variables, with a p-value of < 0.05 indicating statistical significance. All analyses were run separately for girls and boys.

4.8.4 Methods for analysing associations between perceived social support and social phobia and depression. (IV)

Descriptive statistics are reported for the PSSS-R scale as total scores and for family, friend and significant other subscales in SP, DEP, and comorbid SP and DEP groups at T1 and T2 separately for girls and boys. Medians (M) were used as parameters because of the non-Gaussian distribution of the PSSS-R scores. The statistical significance of gender differences of the PSSS-R scores was tested by Mann-Whitney test at $p < 0.05$ level.

To describe current PSS according to disorder status Kruskal-Wallis test was used, because of the non-Gaussian distribution of scores of the PSSS-R, using a significance level of $p < 0.05$. One-to-one differences between disorder groups were analysed by Bonferroni corrected Mann-Whitney test. Because there were four groups, there were six paired comparisons, meaning that a Bonferroni corrected statistical significance of p level $< 0.05/6 = 0.008$ was used.

Analyses of associations between PSS at T1 and disorder status at T2 were conducted on a subsample of the neither SP nor DEP -group at T1 to eliminate the confounding effects of the disorders at baseline. Kruskal-Wallis test with significance level $p < 0.05$ was used in the analyses. Binary logistic regression was used to control for the effects of covariates, with OR and 95% CI to show the association using p -level < 0.05 to indicate the statistical significance.

All data, except data for determining cut-points for the RSES scale, were analysed using Statistical Package for the Social Sciences (SPSS), version 16.0 (SPSS Inc., Chicago, Illinois, USA). Analyses for data for determining cut-points for the RSES scale were accomplished with Predictive Analytics SoftWare (PASW) Statistics 18.

All statistical significances were tested two-tailed.

4.9 Personal involvement

The contribution of the author to this study includes discussion in the Adolescent Mental Health Cohort -study group on issues of the follow-up questionnaires and data collection procedures, choosing the issues to study in follow-up, designing how to study these issues, including choosing the issues to be studied in light of the relevant literature, choosing the data to be collected, selecting covariates to be controlled for and choosing the analysis methods used. The author also conducted the analyses of the data and made the interpretations of their results. As the corresponding author of Articles I, III and IV, most of the writing of these articles was done by the author. As the second author of Article II, the present author was involved in the selection of the subject, study design, analysis and interpretation of the results in collaboration with the corresponding author and other authors. Such collaboration extended to making additions throughout the manuscript on the basis of discussions. The author of this dissertation did the writing, synthesised the results and interpreted the results of the sub studies forming part of the present dissertation.

5 Results

5.1 Prevalence of social phobia, depression and comorbid social phobia and depression (I)

Current prevalence rates of SP, DEP and Comorbid SP and DEP are shown in figures 4 and 5 and in Table 2.

Among girls the prevalence of SP including comorbid cases was 10.1% at age 15 years and 12.5% at age 17 years. Among boys the prevalence of SP including comorbid cases was 7.6% at age 15 years and 9.2% at age 17 years. Among girls the prevalence of DEP including comorbid cases was 11.5% at age 15 years and 10.3% at age 17 years. Among boys the prevalence of DEP including comorbid cases was 5.9% at age 15 years and 6.3% at age 17 years.

Between T1 and T2 there was a significant increase in the prevalence of SP among girls ($P=0.014$). There was a significant decrease in the prevalence of DEP between T1 and T2 in the total cohort ($p=0.021$), but not when girls and boys were analysed separately. The prevalence of comorbid SP and DEP increased significantly among boys ($p=0.025$) between T1 and T2. (Table 2).

At T1 51.7% of girls and 27.9% of boys (total sample 42.9%) with SP also had comorbid DEP (gender difference $p=0.002$). At T1 45.1% of girls, and 35.8% of boys (total sample 42.5%) with DEP at T1 also had comorbid SP (gender difference ns.). At T2 43.1% of girls, and 41.5% of boys with SP (total sample 42.5%) also had comorbid DEP (gender difference ns.). At T2 52.1% of girls, and 60.7% of boys with DEP (total sample 54.9%) also had comorbid SP (gender difference ns.).

Table 2. Prevalence of social phobia and depression among Finnish adolescents at ages 15 and 17 measured by self-report questionnaires. (% (n/N), SP= Social phobia (SPIN \geq 24, R-BDI <8), DEP= depression (SPIN <24, R-BDI \geq 8), comorbid SP/DEP (SPIN \geq 24, R-BDI \geq 8). p=statistical significance of differences between genders *= statistical significance of differences between age 15 and age 17 years, * = p<0.05

	age 15				age 17			
	all	girls	boys	p	all	girls	boys	p
no SP/DEP	85.7% (1747/2038)	83.6% (965/115)	88.5% (782/884)	=0.002	85.0% (1733/2038)	82.6% (953/1154)	88.2% (780/884)	<0.001
SP	5.2% (105/2038)	4.9% (56/1154)	5.5% (49/884)	n.s.	6.4% (130/2038)	7.1%* (82/1154)	5.4% (48/884)	n.s.
DEP	5.3% (107/2038)	6.3% (73/1154)	3.8% (34/884)	=0.016	3.9%* (79/2038)	4.9% (57/1154)	2.5% (22/884)	=0.005
comor-bid SP/DEP	3.9% (79/2038)	5.2% (60/1154)	2.4% (19/884)	<0.001	4.7% (96/2038)	5.4% (62/1154)	3.8%* (34/884)	n.s.

Figure 4. Prevalence rates (%) of SP (with or without DEP) and DEP (with or without SP) and comorbid SP and DEP measured using self-report questionnaires at age 15 years

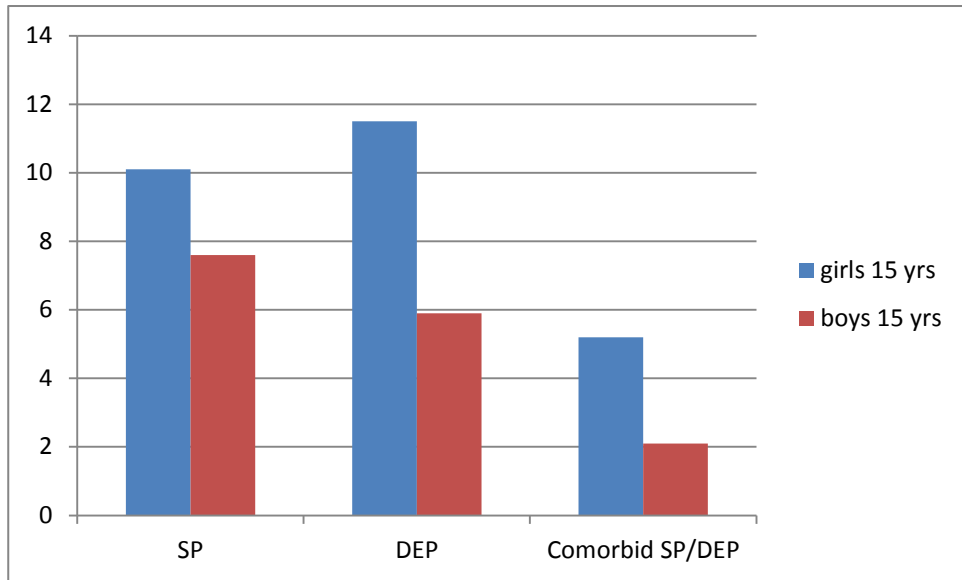
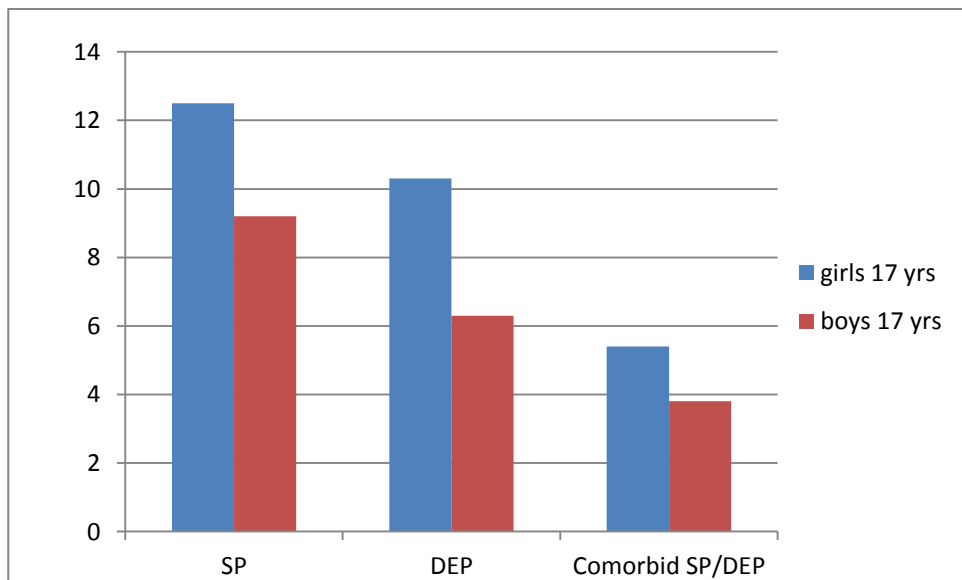


Figure 5. Prevalence rates (%) of SP (with or without DEP) and DEP (with or without SP) and comorbid SP and DEP measured using self-report questionnaires at age 17 years



5.2 Stability of social phobia, depression and comorbid social phobia and depression (I)

Among girls 58.8% of those in the SP -group, 41.1% in the DEP -group and 31.7% in the comorbid SP and DEP -group at T1 changed to the neither SP nor DEP -group at T2. Among boys 55.1% of those in the SP -group, 73.5% in the DEP -group and 57.9% in the comorbid SP and DEP -group at T1 changed to the neither SP nor DEP -group at T2.

5.2.1 Heterotypic continuity

None of the girls and one of the boys (2%) in the SP -group at T1 had DEP without SP at T2. Eight of the girls (11%) and one of the boys (2%) in the DEP -group at T1 had SP without DEP at T2.

5.2.2 Development of comorbidity

Among girls 2.3% of those in the neither SP nor DEP -group, 10.7% in the SP -group, and 24.7% in the DEP -group at T1 moved to the comorbid SP and DEP -group at T2. Among girls, 26.7% of those in the comorbid SP and DEP -group at T1 were also in the comorbid SP and DEP -group at T2. Among boys 2.6% of those in the neither SP nor DEP -group, 12.2% in the SP -group, and 11.8% in the DEP -group at T1 moved to the comorbid SP and DEP -group at T2. Among boys, 21.1% of those in the comorbid SP and DEP -group at T1 were also in the comorbid SP and DEP -group at T2.

Among girls, of those with comorbid SP and DEP at T2, 35.5% were in the neither SP nor DEP -group, 9.7% in the SP -group, 29.0% in the DEP -group, and 25.8% in the comorbid SP and DEP -group at T1. Among boys, of those with comorbid SP and DEP at T2, 58.8% were in the neither SP nor DEP -group, 17.6% were in the SP-group, 11.8% in the DEP -group, and 11.8% in the comorbid SP and DEP -group at T1.

5.2.3 Course of comorbidity

Of those girls with comorbid SP and DEP at T1 31.7% were in the neither SP nor DEP -group, 25.0% in the SP -group, 16.7% in the DEP -group, and 26.7% in the comorbid SP and DEP -group at T2. Of those boys with comorbid SP and DEP at T1 57.9% were in the neither SP nor DEP -group at T2, 5.3% in the SP -group, 15.8% in the DEP -group, and 21.1% in the comorbid SP and DEP -group at T2.

5.2.4 Social phobia as a risk factor for subsequent depression (I)

Among girls 5.4% of those in the neither SP nor DEP -group and 10.7% in the SP -group at T1 had DEP with or without SP at T2. Among boys 4.4% of those in the neither SP nor DEP -group and 14.2% in the SP -group at T1 had DEP with or without SP at T2. SP at T1 was significantly associated with DEP with or without SP at T2 only among boys (OR= 3.6, $p=0.004$, 95% CI 1.507-8.579). Among girls, SP at T1 did not predict subsequent DEP with or without SP (OR= 2.1, $p>0.05$, 95% CI 0.866-5.151). These findings persisted after controlling for age, family structure, both parents' highest educational qualification and externalizing symptoms at T1, (OR= 4.1, $p=0.002$, 95% CI 1.692-10.092 for boys and OR= 2.3, $p>0.05$, 95% CI 0.917-5.595 for girls).

5.2.5 Depression as a risk factor for subsequent social phobia. (I)

Among girls 6.7% of those in the neither SP nor DEP -group and 35.7% in the DEP -group at T1 had SP with or without DEP at T2. Among boys 6.6% of those in the neither SP nor DEP -group and 14.7% in the DEP -group at T1 had SP with or without DEP at T2. DEP at T1 was significantly associated with SP with or without DEP at T2 only among girls (OR= 7.8, $p<0.001$, 95% CI 4.529-13.391). Among boys DEP at T1 did not predict subsequent SP with or without DEP (OR= 2.5, $p>0.05$, 95% CI 0.921-6.682). Among girls the association remained significant after controlling for age, family structure, both parents' highest educational qualification and externalizing symptoms at T1 (OR= 9.6, $p<0.001$, 95% CI 5.179-17.718). After controlling for covariates among boys the OR rose to 2.9, remaining marginally non-significant at 95% confidence level ($p=0.050$, 95% CI 0.999 – 8.262).

5.3 Associations between self-esteem and social phobia and depression

5.3.1 The Rosenberg Self-esteem Scale discriminating adolescents with or without DEP and SP (II)

The RSES discriminated caseness of SP well for girls, $AUC = .83$, $p < .001$, and satisfactorily for boys, $AUC = .73$, $p < .001$. The midpoint of the RSES, 25, was chosen for discriminating low self-esteem by testing sensitivity and specificity of the different cut-points (24-28). For girls the cut-off of 25 points resulted in reasonable sensitivity (62.7%) and specificity (87.2%), but for boys no clear cut-off could be determined.

The RSES discriminated adolescents with and without depression both among girls, ($AUC = .93$, $p < .001$), and among boys ($AUC = .91$, $p < .001$). A cut-point of 25 produced satisfactory discrimination for depression for both genders. The cut-point of 25 had a sensitivity of 78.8% and a specificity of 90.1% for girls and a sensitivity of 58.5 % and a specificity of 94.6% for boys. The test had a positive predictive value of 51.0% for girls and of 40.8% for boys.

The cut-point of 25 of the RSES to classify low self-esteem was best supported by ROC analysis. Using this cut-point 205 (17.9 %) girls and 76 (8.6 %) boys were classified as having low self-esteem.

Among girls the repeated measures MANOVA with low ($RSES < 25$) vs. normal ($RSES \geq 25$) SE as independent and SP and DEP as dependent variable revealed significant between subjects ($F(2, 1134) = 339.61$, $p < .001$, $\eta^2p = .38$), within-subjects ($F(2, 1134) = 19.41$, $p < .001$, $\eta^2p = .03$), and interaction effects ($F(2, 1134) = 29.99$, $p < .001$, $\eta^2p = .05$). Among girls with low SE symptoms of SP did not change from baseline, while symptoms of DEP decreased from baseline to follow-up. Also among boys the analysis revealed a significant difference between subjects ($F(2, 865) = 68.35$, $p < .001$, $\eta^2p = .14$), within-subjects ($F(2, 865) = 19.77$, $p < .001$, $\eta^2p = .04$), and interaction effects ($F(2, 865) = 27.94$, $p < .001$, $\eta^2p = .06$). A marked decrease in the symptoms of both SP and DEP was observed among boys with low SE. Boys with low SE differed from boys with normal SE regarding symptoms of SP and DEP.

At baseline 36.1% of the girls and 22.4% of the boys with the RSES scores below the cut-point of 25 scored ≥ 24 on SPIN, and at follow-up the corresponding figures were 33.8% and 14.7%. For DEP, 51.0% of the girls and 40.8% of the boys with low SE scored ≥ 8 on the BDI-13 at baseline and at follow-up 34.3% and 18.4% respectively. Girls and boys with low SE differed significantly from girls and boys with normal SE ($p < .001$) as regards having SP or DEP, except for having SP at follow-up among boys ($p = .53$).

5.3.2 Self-esteem according to depression and social phobia (III)

The means of the RSES scores in girls and boys in different disorder groups are shown in Table 3, and in Figures 6-9. The means of the RSES scores were significantly ($p < 0.001$) lower in all disorder groups than in the neither SP nor DEP group at both age 15 and 17 in both genders.

Table 3. Means of the Rosenberg Self-Esteem Scale at 15 and at 17, among boys and girls, SP= Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP= depression (SPIN < 24 , R-BDI ≥ 8), comorbid SP/DEP (SPIN ≥ 24 , R-BDI ≥ 8). M= mean, SD= standard deviation. p=Statistical significance of differences between boys and girls, Mann-Whitney test.

		15y			17y			
		Girls	Boys	p	Girls	Boys	p	
Current disorder status at 15 or at 17	No SP/ DEP	M	30.1	31.4	<0.001	31.1	32.3	<0.001
		SD	4.3	4.7		4.6	4.7	
		N	N=948	N=775		N=953	N=767	
	SP	M	26.1	28.6	=0.004	26.9	27.6	n.s.
		SD	4.2	4.3		4.4	3.9	
		N	N=58	N=50		N=81	N=48	
	DEP	M	22.7	23.5	n.s.	23.2	22.5	n.s.
		SD	3.6	4.2		4.7	3.0	
		N	N=72	N=35		N=57	N=23	
	comorbid SP/DEP	M	19.6	20.6	n.s.	19.9	22.6	=0.006
		SD	4.0	5.6		3.5	4.4	
		N	N=60	N=18		N=62	N=34	
	all	M	28.9	30.7	<0.001	29.8	31.4	<0.001
		SD	5.2	5.1		5,5	5.3	
		N	N=1144	N=883		N=1155	N=879	

Figure 6. Means of the Rosenberg Self-Esteem Scale at age 15, among girls, SP= Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP= depression (SPIN < 24 , R-BDI ≥ 8), com SP DEP (SPIN ≥ 24 , R-BDI ≥ 8). Statistical significance of differences between any disorder group to no SP /DEP group is $p < 0.001$ by Mann-Whitney test

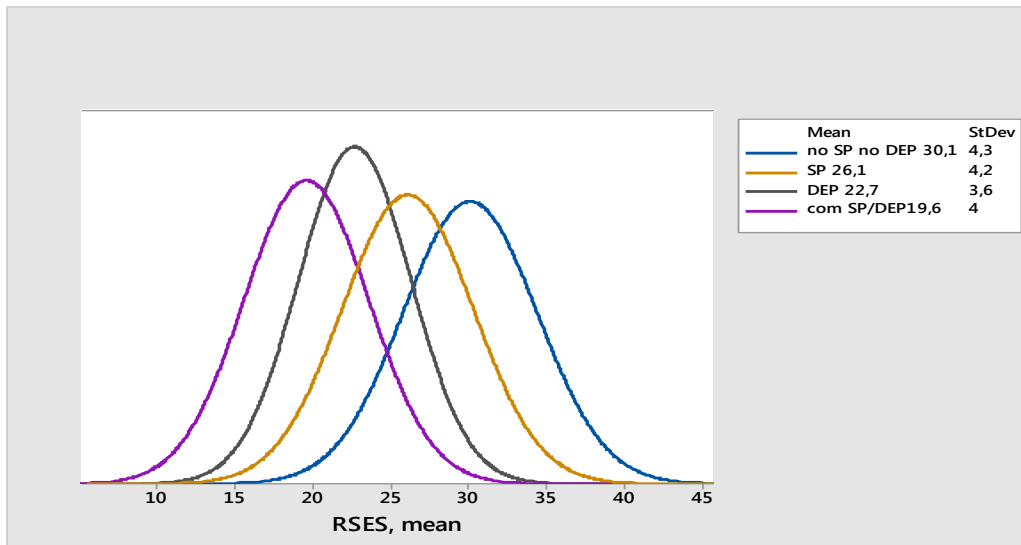


Figure 7. Means of the Rosenberg Self-Esteem Scale at age 17, among girls, SP= Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP= depression (SPIN < 24 , R-BDI ≥ 8), com SP DEP (SPIN ≥ 24 , R-BDI ≥ 8). Statistical significance of differences between any disorder group to no SP /DEP group is $p < 0.001$ by Mann-Whitney test

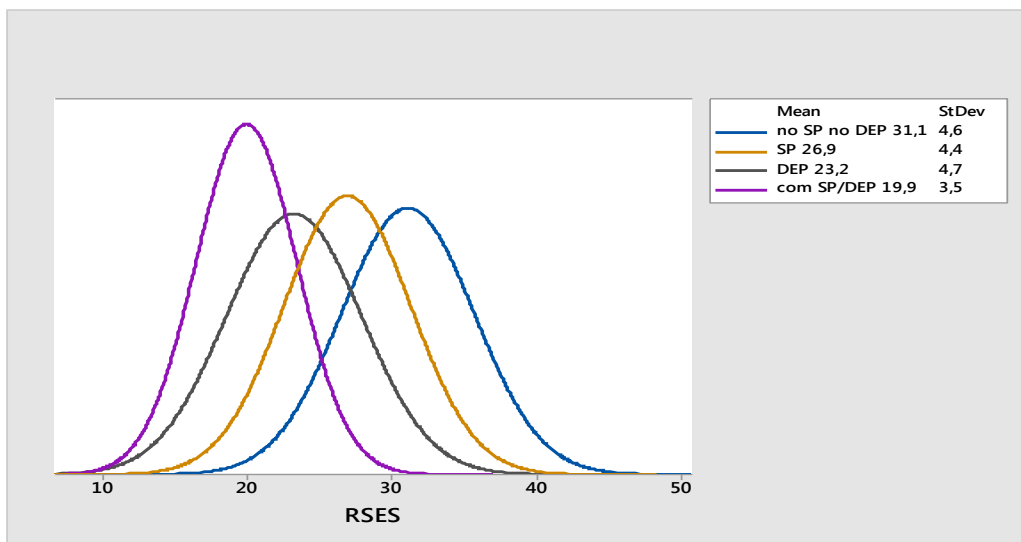


Figure 8. Means of the Rosenberg Self-Esteem Scale at age 15, among boys, SP= Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP= depression (SPIN < 24 , R-BDI ≥ 8), com SP /DEP (SPIN ≥ 24 , R-BDI ≥ 8). Statistical significance of differences between any disorder group to no SP /DEP group is $p < 0.001$ by Mann-Whitney test

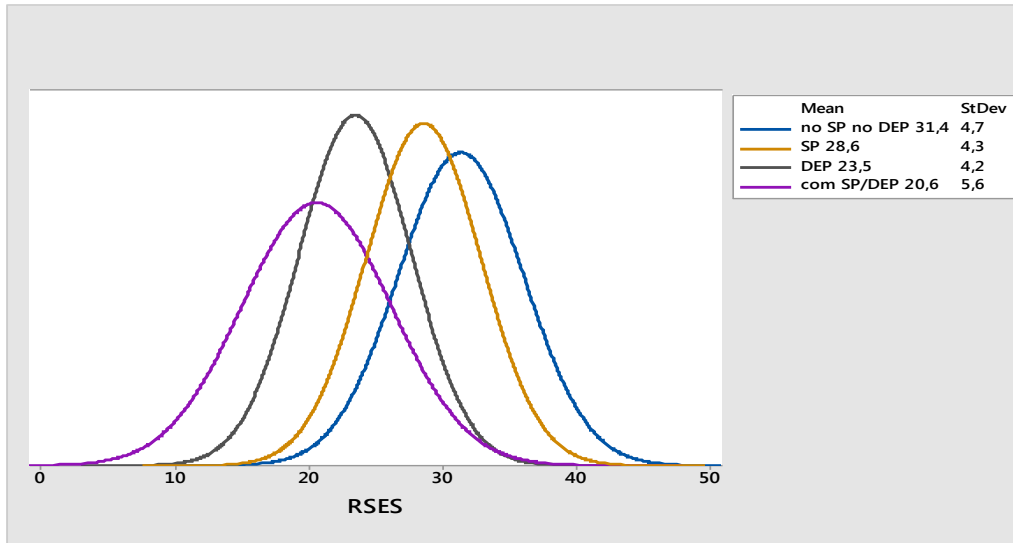
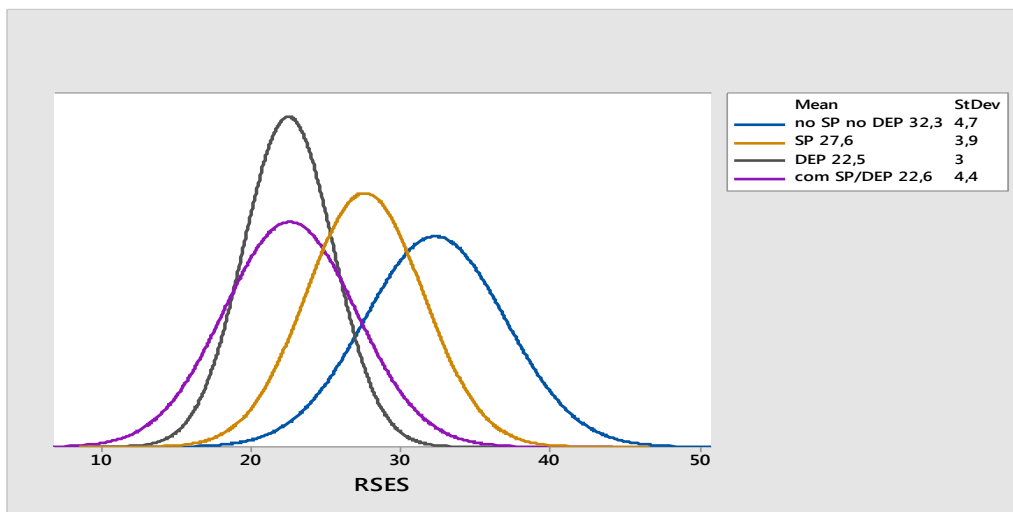


Figure 9. Means of the Rosenberg Self-Esteem Scale at age 17, among boys, SP= Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP= depression (SPIN < 24 , R-BDI ≥ 8), com SP DEP (SPIN ≥ 24 , R-BDI ≥ 8). Statistical significance of differences between any disorder group to no SP /DEP group is $p < 0.001$ by Mann-Whitney test



5.3.3 Self-esteem as a mediator of the association between earlier SP and subsequent DEP, and vice versa. (III)

SP at T1 was associated with DEP with or without SP at T2 only among boys (OR= 3.6, see above). Among boys SP at T1 was associated with ‘change in SE from T1 to T2’ (OR= 0.9, $p < 0.001$, 95% CI= 0.821-0.932). ‘Change in SE from T1 to T2’ was associated with DEP with or without SP at T2 (OR= 0.5, $p < 0.001$, 95% CI= 0.456-0.633). The association between SP at T1 and DEP with or without SP at T2 became statistically non-significant after adding ‘change in SE from T1 to T2’ to the original analysis of association and controlling for SE at T1 (OR= 1.1, $p = 0.856$, 95% CI= 0.343-3.631). (Figure 1 in the Study III) Thus ‘change in SE from T1 to T2’ mediated the association between SP at T1 and DEP with or without SP at T2 among boys.

Similarly, DEP at T1 was associated with SP with or without DEP at T2 statistically significantly only among girls (OR= 7.8, see above). Among girls DEP at T1 was associated with ‘change in SE from T1 to T2’, (OR= 0.9, $p = 0.004$, 95%CI= 0,851-0.969). ‘Change in SE from T1 to T2’ was associated with SP with or without DEP at T2 (OR= 0.8, $p < 0.001$, 95% CI= 0.732-0.825). After adding ‘change in SE from T1 to T2’ into the original analysis of association and controlling for SE at T1 OR of association between DEP at T1 and SP with or without DEP at T2 decreased remarkably, but remained statistically significant (OR= 2.4, $p = 0.021$, 95% CI= 1.141-4.858). (Figure 2 in the Study III,) Thus ‘change in SE from T1 to T2’ partially mediated the association between DEP at T1 and SP with or without DEP at T2 among girls.

5.4 Association between perceived social support and social phobia and depression (IV)

5.4.1 Perceived social support and current disorder status (IV)

Compared to subjects in the neither SP nor DEP group, PSS from all sources, family, friends and significant other as well as the total score of the PSSS-R, was lower among those in the SP, DEP and comorbid SP and DEP groups at both T1 and T2 among both genders ($p < 0.001$ in all comparisons).

Among girls at both T1 and T2, the PSSS-R scores, total score and all subscale scores, were lowest among those in comorbid SP and DEP group. All scores were highest in the neither SP nor DEP group. Low total score of the PSSS-R scale and low PSS from all sources were significantly associated with all disorder groups in both surveys, except for PSS from family with SP at T1. PSS from family in both surveys, and total score of the PSSS-R as total and from significant other subscale at T2 were lower in the DEP group than in the SP group. (Tables 4 and 5).

Similarly among boys at T1 and T2 the PSSS-R scores, total score and all subscale scores, were lowest in the comorbid SP and DEP group. PSS was highest in the neither DEP nor SP group also among boys. PSS from family was lower in the DEP group than in the SP group at both surveys. PSS from significant other at T2 was lower in the SP group than in the DEP group. (Tables 4 and 5).

Table 4. Current PSSS-R scores according to disorders at age 15 years among girls and boys. SP= Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP= depression (SPIN < 24 , R-BDI ≥ 8), comorbid SP/DEP (SPIN ≥ 24 , R-BDI ≥ 8). M=median, SD=standard deviation Statistical significance: 1) = p of gender difference, Mann-Whitney test, 2)= p of differences between disorder -groups vs. no SP, no DEP -group ** < 0.001 , * < 0.00833 , Bonferroni corrected Mann-Whitney –test., 3) = p of differences between disorder -groups vs. SP, no DEP -group ++ < 0.001 , + < 0.00833 , Bonferroni corrected Mann-Whitney –test., 4) = p of differences between disorder -groups vs. SP, no DEP -group $\alpha < 0.001$, $\alpha < 0.00833$, Bonferroni corrected Mann-Whitney –test.

		No SP/ Dep		1)p	SP		1)p	DEP		1)p	comorbid SP/DEP		1)p	Total cohort		1)p
		Girls N=945	Boys N=759	between genders	Girls N=56	Boys N=49	between genders	Girls N=73	Boys N=35	between genders	Girls N=60	Boys N=18	between genders	Girls N=114	Boys N=866	between genders
PSSS-R total	M	55.0	48.0	<0.001	53.0	41.0	<0.001	47.0	40.0	=0.002	42.2	25.0	<0.001	54.0	48.0	<0.001
	SD	7.00	10.72		8.70	11.90		10.04	14.45		11.81	12.18		8.34	11.58	
					2)*	2)**		2)**	2)**		3)++4) α	3)++				
Family factor	M	18.0	18.0	n.s.	16.5	16.0	n.s.	13.0	12.0	n.s.	12.5	11.4	n.s.	17.0	18.0	n.s.
	SD	3.29	3.57		3.91	4.14		4.60	5.03		4.65	5.18		3.83	3.94	
					2)*	2)**3)+		2)**	2)**3)+		3)++	3)++				
Friend factor	M	19.0	16.0	<0.001	18.0	13.0	<0.001	17.0	13.0	=0.001	14.1	7.5	=0.001	19.0	16.0	<0.001
	SD	2.95	4.17		3.37	4.62		4.27	5.76		4.86	4.65		3.35	4.43	
					2)*	2)*		2)**	2)**		2)**3)+	2)**				
											4) α	3)+				
Significant other factor	M	20.0	16.0	<0.001	18.5	13.0	<0.001	19.0	10.6	<0.001	16.0	6.1	<0.001	19.0	16.0	<0.001
	SD	2.70	4.48		3.48	4.74		4.50	6.22		4.96	4.31		3.17	4.74	
					2)*	2)*					2)**	2)**				
											4) α	3)+				

Table 5. Current PSSS-R scores according to disorders at age 17 years among girls and boys. SP= Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP= depression (SPIN < 24 , R-BDI ≥ 8), comorbid SP/DEP (SPIN ≥ 24 , R-BDI ≥ 8). M=median, SD=standard deviation Statistical significance: 1) = p of gender difference, Mann-Whitney test, 2)= p of differences between disorder -groups vs. no SP, no DEP -group $** < 0.001$, $* < 0.00833$, Bonferroni corrected Mann-Whitney –test., 3) = p of differences between disorder -groups vs. SP, no DEP -group $+++ < 0.001$, $++ < 0.00833$, Bonferroni corrected Mann-Whitney –test., 4) = p of differences between disorder -groups vs. SP, no DEP -group $+++ < 0.001$, $++ < 0.00833$, Bonferroni corrected Mann-Whitney –test.

		No SP/ Dep		1)p between genders	SP		1)p between gender s	DEP		1)p between genders	comorbid SP/DEP		1)p between n gender s	Total cohort		1)p between genders
		Girls N=945	Boys N=759		Girls N=56	Boys N=49		Girls N=73	Boys N=35		Girls N=60	Boys N=18		Girls N=1140	Boys N=866	
PSSS- R total	M	57.0	51.0	<0.001	52.0	46.0	=0.006	42.0	43.5	n.s.	44.5	37.0	=0.001	56.0	50.0	<0.001
	SD	6.61	9.51		7.85	8.01		11.74	11.94		10.61	12.90		8.12	10.15	
					2)**	2)*		2)**	2)*		3)++	3)++				
Family factor	M	18.0	18.0	<0.001	16.0	17.0	=0.036	12.0	12.5	n.s.	14.0	12.0	n.s.	18.0	17.0	n.s.
	SD	3.42	3.53		3.07	2.85		4.97	5.31		3.98	4.59		3.80	3.80	
					2)**			2)**	2)**		2)**	2)**				
					3)++	3)++		3)++	3)++		3)++	3)++				
Friend factor	M	20.0	17.0	=0.015	17.0	15.0	=0.001	15.0	16.0	n.s.	15.0	12.0	=0.014	20.0	16.0	<0.001
	SD	2.74	3.72		3.53	3.47		5.12	4.22		4.72	5.41		3.32	3.91	
					2)**	2)**		2)**	2)**		2)**3)+	2)**				
Signifi- cant other factor	M	20.0	18.0	<0.001	19.0	15.5	<0.001	16.0	17.5	n.s.	17.0	12.0	<0.001	20.0	17.0	<0.001
	SD	2.30	3.90		3.23	3.80		4.60	5.33		4.35	5.39		2.84	4.15	
					2)*	2)*		2)**	2)**		2)**3)+	2)**3)+				
					3)++	3)++		3)++	3)++		4)±					

5.4.2 Perceived social support as a risk factor for subsequent disorders (IV)

In the analyses of the relationship between low PSS at T1 and disorder groups at T2 the associations were found only with the DEP group. Among girls low total score of the PSSS-R ($p=0.004$), and low PSS from family ($p=0.008$) and friends ($p=0.008$) at T1 predicted DEP at T2. Among boys the total score of the PSSS-R ($p=0.005$), and low PSS from family ($p=0.008$) and significant other ($p=0.001$) at T1 were associated with DEP at T2.

Among girls after controlling for age, family structure, father's highest educational qualification, mother's highest educational qualification and externalizing behaviour at T1, low total score of the PSSS-R, low PSS from friends and low PSS from significant other at T1 predicted DEP at T2. Among boys low PSSS-R total score and low PSS from significant other at T1 predicted DEP at T2. Low PSS from family at T1 was not predictive for subsequent DEP among either gender after controlling for covariates. (Table 6).

PSS as total score of the PSSS-R or from any source at T1 was not associated with SP or comorbid SP and DEP at T2 among either gender. (Table 6).

Table 6. Perceived social support in no SP/DEP group at T1 and disorder status at T2 among boys and girls, SP= Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP= depression (SPIN < 24 , R-BDI ≥ 8), comorbid SP/DEP (SPIN ≥ 24 , R-BDI ≥ 8). Odds ratios (OR) compared to the no SP/DEP group (SPIN score < 24 , R-BDI score < 8) at age 17 years, statistical significance and confidence interval at 95% level after controlling for covariates of age at T1, family structure at T1, mother's highest educational qualification at T1, father's highest educational qualification at T1, and externalizing symptoms at T1.

		Disorder status at age 17 years, n=disorder/no disorder						
		Girls			Boys			
		SP n= 41/851	DEP n= 30/851	comorbid SP/DEP n=22/851	SP n= 30/686	DEP n= 14/686	comorbid SP/DEP n=20/686	
Perceived social support at age 15 years	Total score	OR	0.986	0.944	0.964	0.986	0.959	0.999
		p	0.103	0.006	0.143	0.380	0.046	0.955
		95% CI	0.954-1.018	0.906-0.984	0.918-1.012	0.954-1.018	0.921-0.999	0.959-1.041
	Family	OR	0.974	0.918	0.953	1.015	0.909	1.037
		p	0.601	0.073	0.441	0.790	0.121	0.602
		95% CI	0.880-1.076	0.837-1.008	0.844-1.077	0.907-1.137	0.805-1.025	0.904-1.190
	Friend	OR	0.933	0.897	0.932	0.945	0.933	0.985
		p	0.114	0.031	0.248	0.176	0.238	0.772
		95% CI	0.855-1.017	0.812-0.990	0.828-1.050	0.870-1.026	0.832-1.047	0.888-1.092
	Significant other	OR	0.918	0.871	0.908	0.960	0.882	0.987
		p	0.071	0.009	0.105	0.306	0.014	0.784
		95% CI	0.836-1.007	0.786-0.975	0.807-1.020	0.899-1.038	0.798-0.975	0.896-1.086

5.5 Gender differences and gender specific patterns

5.5.1 Gender differences and gender specific patterns of the prevalence of social phobia, depression and comorbid social phobia and depression. (I)

Boys were more often classified into the neither SP nor DEP group than girls in both surveys ($p=0.002$ at T1 and <0.001 at T2). DEP at both surveys ($p=0.016$ at T1 and $p=0.005$ at T2) and comorbid SP and DEP at T1 ($p<0.001$) were more prevalent among girls than boys. The prevalence of SP did not differ between genders. (Table 2).

There was a significant increase in the prevalence of SP among girls (from 4.9% to 7.1%, $P<0.05$) between T1 and T2, but not among boys. The prevalence of comorbid SP and DEP increased significantly only among boys between T1 and T2 (from 2.1% to 3.8%, $P=0.05$). (Table 2). At T1 girls with SP had comorbid DEP more frequently than boys with SP (51.7% of girls vs. 27.9% of boys, $p=0.002$).

Boys recovered from DEP more frequently than girls during follow-up, (41.1% of girls vs. 73.5% of boys, $p=0.002$).

5.5.2 Gender specific patterns in the association between social phobia and depression (I)

SP at T1 was associated with DEP with or without SP at T2 among boys. Among girls SP at T1 did not predict DEP with or without SP at T2.

DEP at T1 was associated with SP with or without DEP at T2 among girls. Among boys DEP at T1 did not predict SP with or without DEP at T2.

5.5.3 Gender specific patterns on the Rosenberg Self-esteem Scale discriminating adolescents with or without DEP and SP (II)

A cut-off of 25 points on the RSES differentiated between those with SP and those without SP well among girls, and satisfactorily among boys. For girls the cut-off of 25

points on the RSES had a reasonable sensitivity and specificity for predicting SP, but for boys no clear cut-point could be determined in predicting SP. Girls with low SE differed significantly from girls with normal SE in having DEP or SP, but boys with low SE differed from boys with normal SE only in having DEP.

5.5.4 Gender differences in self-esteem (III)

Boys had higher ($p < 0.001$) mean scores on the RSES in the whole sample in both surveys, in the neither SP nor DEP group in both surveys ($p < 0.001$), in the SP group at T1 ($p = 0.004$), and in the comorbid SP and DEP group at T2 ($p = 0.006$). (Table 3).

5.5.5 Gender specific patterns of self-esteem in the association between social phobia and depression (III)

The association between SP at T1 and DEP with or without SP at T2 among boys was mediated by decrease in SE. The association between DEP at T1 and SP with or without DEP at T2 was partially mediated by decrease in SE among girls (Study III, Figures 1 and 2).

Among girls SP at T1 was not associated with change in SE from T1 to T2, while among boys this association was found. Among boys DEP at T1 was not associated with 'change of SE from T1 to T2', while this association was true among girls (see above).

5.5.6 Gender differences in perceived social support (IV)

Girls had higher total scores than boys on the friends and significant other subscales of the PSSS-R in all disorder groups in both surveys except in the DEP group at T2. On the family subscale girls had higher scores only in the neither SP nor DEP group, boys perceived more support from family in the SP group at T2. Otherwise PSS from family did not differ between genders. In the DEP group at T2 there were no gender differences in PSS from any source. (Table 4 and 5).

5.5.7 Gender specific patterns in longitudinal associations of low perceived social support with social phobia and depression (IV)

Low PSS from friends at T1 predicted DEP at T2 only among girls (Table 6).

6 Discussion

6.1 Overview of the results

Prevalence rates of self-reported symptomatology of social phobia and depression were high in adolescence. Social phobia affected one out of ten girls and 7.5% of boys at age 15 years, being even more common at age 17 years in both genders. Depression in girls was equally common as social phobia at age 15 years, but there was no increase in prevalence at age 17 years. In boys depression was somewhat less common than social phobia at age 15, and the prevalence increased slightly until age 17 years. Comorbidity was common at both ages 15 and 17, affecting over 40% of the adolescents with social phobia or depression. There was much instability in the course of social phobia and depression. In girls only earlier depression predicted subsequent phobia, earlier social phobia did not predict later depression, associations being vice versa in boys, earlier social predicted subsequent depression, but earlier depression did not predict social phobia.

The Rosenberg's Self-Esteem Scale could be dichotomized with a cut-point of under 25 points to indicate low self-esteem with satisfactory sensitivity, specificity and positive and negative predictive values. Low self-esteem defined by the dichotomized Rosenberg's Self-Esteem Scale at 25 points could be used as a risk-indicator for depression in both genders and for social phobia in girls.

Boys had higher self-esteem than girls at both ages. Both social phobia and depression were associated cross-sectionally with low self-esteem in both genders compared to self-esteem of adolescents without either disorder. In boys decrease in self-esteem mediated the association between earlier social phobia and subsequent depression. In girls decrease in self-esteem mediated partially the association between earlier depression and subsequent social phobia.

Perceived social support outside the family was higher in girls than in boys. Perceived social support was lower among affected adolescents than those without either social phobia or depression. Low perceived support from significant other in both girls and boys and from friends in girls was associated with later depression. Perceived social support

from any source was not associated with social phobia or comorbid social phobia and depression.

6.2 Symptomatology of social phobia and depression is common in middle adolescence

As in previous epidemiological studies in the present study, too, social phobia and depression were common in middle adolescence (Kessler and Walters 1998; Kessler et al. 2001; Lewinsohn et al. 1998; Roberts et al. 1995). The prevalence of depression in the present study was in accordance with earlier reports of general population studies, but the prevalence of social phobia was somewhat higher than in earlier general population studies. Higher prevalence of social phobia may be Finnish or even more local phenomena. However, in Ranta et al.'s (2009) study prevalence rates were lower, while the study was also made in Tampere region, although in suburban area. It may be caused by the measure setting under supervision of teacher, which may provoke situational phobic symptoms, and thus current point prevalence may include also cases which otherwise could be subsyndromal. As hypothesized, social phobia and depression appeared also in this study to be highly co-morbid among both boys and girls at ages 15 and 17. This was also in accordance with existing general population adolescent studies (Essau et al. 1999; Ranta et al. 2009; Wittchen et al. 2000). During follow-up prevalence of social phobia without depression increased among girls, prevalence of depression without social phobia decreased in the whole group, and prevalence of comorbid social phobia and depression increased among boys. Recovery was quite common and switching from one group to another in two-year follow-up occurred. These findings are in accordance with earlier findings reporting the instability of these disorders, (Kessler and Walters 1998; Wittchen and Fehm 2003). In earlier general population studies prevalence estimates of depression have not decreased (Lewinsohn et al. 1998), but in this study decrease in prevalence occurred in depression without social phobia. In this study the decrease in depression without social phobia was mostly due to moving to the comorbid group, especially among boys. The decrease of the prevalence of depression without social phobia may be partly explained by the greater number of drop-outs among those with depression at baseline. Heterotypic continuity from social phobia to depression was almost absent, and it was likewise quite rare from depression to social phobia, although more frequent than vice versa. This concurs with the findings of the GSMS, where also heterotypic continuity

from depression to anxiety was more common than from anxiety to depression (Costello et al. 2003).

In this study period in the middle adolescence from age 15 years to 17 years occurs several developmental changes which may contribute the changes in prevalence traits found in this study. Emotional experiences intensifies, there are feelings of sorrow over the lost childhood relationships, new feelings of attachment to new objects and many disappointments (Aalberg and Siimes 2007). Psychological defences in middle adolescence are immature (Sadock et al. 2009), and social relations are fundamentally changing, first dating experiences being in many cases instable and causing lots of sorrow and disappointing feelings. These may be contributing factors for changing prevalence rates of social phobia and depression.

Challenges in the external or role development during this age period may associate with changing prevalence rates of social phobia and depression. Basic survey of this study was conducted during the last year of the comprehensive school. Next challenge was to seek the secondary schools such as high school or occupational schools. There may have been disappointments in this challenge. Old friends are often lost, new relationships must be build. There is a threat for beginning of marginalization process distressing in that age. End of the comprehensive school means often a huge step in adolescent development, for which many adolescents may be afraid for.

6.3 Association between social phobia and depression differs by gender

Elevated risk for subsequent depression among adolescents with social phobia as reported in earlier general population studies (Chavira et al. 2004; Kessler et al. 1999; Weiller et al. 1996) was found in boys, but not in girls in the present study. Among girls with depression at age 15 years there was an increased risk for subsequent social phobia at age 17 years which was not found among boys. There are no adolescent studies reporting depression as a risk factor for subsequent social phobia or this kind of gender difference. In one study on an adult general population major depression was found to be a risk factor for social phobia (Acarturc et al. 2009). Prospective general population-based cohort study design with narrow age span made it possible to form a reliable picture of the development of these disorders in adolescence. Analyses separately for girls and boys clarified the picture of the development of comorbidity for both directions, from social

phobia to depression and from depression to social phobia. In earlier studies such analyses have not been reported. In girls there may have been earlier social phobia before the age of 15 years, which may have turned to depression at age 15 years. Thus social phobia being the first disorder of these two may be true in girls too, even if not found in the time window studied. This is supported by the fact that the average age of onset of social phobia is before 15 years, and the mean onset of depression is somewhat later (Chartier et al. 1998; Costello et al. 2006; Lewinsohn et al. 1998; Wittchen et al. 1999). In addition, social phobia has been shown not to be a stable state (Wittchen and Fehm 2003). At age 15 years comorbid social phobia and depression was more frequent in girls than in boys. Girls may have already developed comorbid social phobia and depression by age 15 years, in which social phobia preceded depression. However, because in the follow-up the heterotypic course from social phobia to depression was very rare, the course from preceding depression to subsequent social phobia seems most plausible.

6.4 Low self-esteem as a risk indicator of social phobia and depression

It was possible to define a cut-point on the Rosenberg Self-esteem Scale for measuring low self-esteem and this could be used as a risk indicator for later social phobia and depression. The suggested cut-point of 25 points on the Rosenberg Self-Esteem Scale has satisfactory sensitivity, specificity, positive and negative predictive values. Current social phobia and depression were associated with the Rosenberg Self-Esteem Scale scores under the cut-point of 25. Social phobia was found in the follow-up in 15% to 34% of those with low self-esteem at baseline, and from one fifth to one third of the girls and boys with low self-esteem at age 15 years had depression at follow up. Thus, low self-esteem measured by the Rosenberg Self-esteem Scale can be regarded as a potential indicator of both concurrent and prospective psychological distress. Due to relationships with current and later social phobia and depression, self-esteem could well be made a primary focus for the identification of distressed adolescents.

6.5 Social phobia and depression is associated with self-esteem

Low self-esteem at age 15 and at age 17 was associated with both depression and social phobia in cross-sectional analyses. These findings are in accordance with adult general population studies of social phobia (Acarturc et al. 2009; Chartier et al. 1998; Izgic et al.

2004) and adolescent general population studies of depression (Rosenberg 1965; Schmitz et al. 2003). The association was strongest in social phobia and depression and weakest in social phobia without depression. Depression may affect self-esteem more strongly than social phobia in adolescence, although these analyses were cross-sectional and thus this assumption cannot be verified by these findings. There are no earlier studies comparing the strengths of the associations of self-esteem and social phobia, depression or comorbid social phobia and depression among boys and girls.

The association may be bi directional, ending up to vicious circle. Depression and social phobia is associated with low self-esteem. Low self-esteem, in turn, may lead to insecurity in social situations and nervousness and enhance stress. This may worsen symptoms of social phobia or depression, which again is associated with low self-esteem. This emphasizes the importance in identifying these disorders and also to pay attention to self-esteem.

6.6 Decrease in self-esteem as a mediator in the association between social phobia and depression

The hypothesis of the mediating role of decrease in self-esteem in the association of social phobia and later depression, or vice versa, was supported. In boys the association between social phobia without depression at age 15 years and depression with or without social phobia at age 17 years was found to be perfectly mediated by decrease in self-esteem. In girls decrease in self-esteem partially mediated the association of depression without social phobia at age 15 years and social phobia at age 17 years. Self-esteem being a mediator between social phobia and depression in prospective adolescent studies has not been reported before.

Baron and Kenny (1986) postulated that "in psychological research a perfect mediation is a rare phenomenon, but also in partial mediation, a significant reduction in the association between independent and dependent variable, demonstrates that a given mediator indeed is potent, albeit not both necessary and sufficient condition for an effect to occur". Thus the finding of decrease in self-esteem being a partial mediator between depression and subsequent social phobia among girls in the current study is worth noticing.

In the study by Dumont and Provost (1999) low self-esteem was found to be associated with avoidance as a coping style and high self-esteem with active problem solving as a

coping style. According to that, the authors speculated that the association between low self-esteem and depression may be mediated by coping style (Dumont and Provost 1999). This association may be true in this study also, because avoidance is one of the main characteristics in social phobia. The role of the coping style in the associations of this study needs to be studied further.

The sociometric theory of self-esteem being affected by the extent to which a person is included/ accepted or excluded / rejected by others (Leary et al., 1998) was partly supported by the findings of the present study. Adolescents with social phobia or depression may perceive exclusion or rejection by others, which affect self-esteem, and decrease in self-esteem further leads to the development of a subsequent disorder.

6.7 Low social support as a risk factor for depression

Cross-sectionally PSSS-R total score and most of PSSS-R subscales were associated with current social phobia and depression in the present study, as in many earlier general population studies (Denny et al. 2004; Kaltiala-Heino et al. 2001; McDonald et al. 2010; Piko et al. 2009).

Perceived social support was lowest among those with both social phobia and depression and highest among those free from both disorders. Depressed adolescents perceived lower social support from the family than adolescents with social phobia. Adolescents suffering from social phobia may turn more to their family and reach more support than those suffering from depression. Contrary to what could be hypothesized by the nature of the disorders, perceived support from outside family was not lower among adolescents with social phobia than adolescents with depression. This may be caused by measuring perceived support instead of enacted support. Depressed adolescents may feel that nobody likes them and perceive less support from friends and significant other. Adolescents with social phobia may still have a good intimate relationship with one or two good friends or a significant person, thus perceiving support from them.

Low perceived social support was associated with subsequent depression. Contrary to our hypothesis, perceived social support was not associated with social phobia or comorbid social phobia and depression. After controlling for covariates, depression at age 17 years was predicted by low perceived social support in total, and by low perceived support from significant other in both genders. In girls, but not in boys, low perceived support from

friends was also associated with later depression. In earlier general population studies, too, low social support has been reported to predict depression (Bettge et al. 2008; Heponiemi et al. 2006; Schraedley et al. 1999). Low social support from family was not associated with depression, unlike in most other studies on mid-adolescent samples (Aseltine et al. 1994; McDonald et al. 2010; Sheeber et al. 1997). However, as in the present study, in the OADP low perceived support from family was not associated with subsequent depression (Lewinsohn, et al. 1997a). This finding, which differs from most of the earlier studies, may be due to controlling for covariates, as it was controlling for these which levelled out the predictive association between low family support and subsequent depression. Low support from friends has been associated with later depression in some studies on mid-adolescent general population (Lewinsohn et al. 1997a; McDonald et al. 2010) but not in all (Aseltine et al. 1994). In this study this was true in girls but not in boys.

Studies on social support as a risk factor for social phobia are scarce. As in this study, La Greca and Lopez (1998) found that neither low family support nor low perceived support from significant other was associated with social phobia. However unlike here, McDonald et al. (2010) found that low support from friends predicts subsequent social phobia. This may be explained by the fact that the sample for risk factor analyses was free of both social phobia and depression at age 15 years. Depression is associated with lower perceived social support in this study and in many earlier studies (Aseltine et al. 1994; Bettge et al. 2008; Kaltiala-Heino et al. 2001; McDonald et al. 2010; Piko et al. 2009; Schraedley et al. 1999; Sheeber et al. 1997; Stice et al. 2004), and also associated with subsequent social phobia (Beesdo et al. 2007; Bittner et al. 2004; Lewinsohn et al. 1997b; Wittchen et al. 1999), thus it is important to control for the effect of both of these disorders when studying risk factors.

Low perceived social support from any source at age 15 was not associated with subsequent comorbid social phobia and depression although it predicted depression without social phobia. A possible explanation for this includes firstly that comorbid social phobia and depression may be more linked to risk factors of social phobia than with risk factors of depression, secondly, depression that coexists with social phobia may develop differently from depression without social phobia, and thirdly, comorbid social phobia and depression may be a qualitatively different disorder than social phobia or depression alone.

6.8 Gender differences

The prevalence of depression, but not that of social phobia, differed between genders. This differs from many adolescent general population studies where female predominance in prevalence rates of social phobia have been reported (Dell'osso et al. 2002; Gren-Landell et al. 2009; La greca and Lopez 1998; Shields 2004; Wittchen et al. 1999). However, in a Finnish general population study there was no gender difference in prevalence of social phobia, either (Ranta et al. 2009). This could be due same age group and similar school settings in the methodology of these studies. There were some other differences in prevalence and courses of social phobia and depression: a significant increase in the prevalence of social phobia only among girls, and a significant increase in social phobia and depression only among boys between ages 15 and 17 years. Furthermore, girls with social phobia more often also had comorbid depression at age 15 years, and boys were more often recovering from depression between ages 15 and 17 years. Many other general population studies have likewise reported gender differences in the prevalence and in the course of these disorders. These findings suggest that these disorders develop differently in boys and girls (Dell'osso et al. 2002; Ge et al.2001; Gren-Landell et al. 2009; Hankin and Abrahamson 1999; Kessler et al. 2001; La greca and Lopez 1998; Nolen-Hoeksema and Girgus 1994; Shields 2004; Wittchen et al. 1999). These findings further emphasize the value of studying girls and boys separately in these disorders.

Social phobia was found to be a risk factor for subsequent depression only in boys. In girls depression was a risk factor for subsequent social phobia. In contrast to the finding in this study, in the prospective EDSP study female gender was associated with greater risk for subsequent depression among adolescents with social phobia (Beesdo et al. 2007). In the NCS reporting retrospective findings on a mixed adolescent–adult general population, no gender differences were found in the association between social phobia and lifetime mood disorders (Kessler et al. 1999). The different findings may be explained by the narrower age cohort in the present study, which allows a naturalistic observation of the development of these two disorders.

Boys had higher self-esteem than girls if they had neither social phobia nor depression, as shown in earlier studies (Raevuori et al. 2007). This did not hold true for those suffering from depression without social phobia at age 15 years or at age 17 years, social phobia and

depression at age 15 years, and social phobia without depression at age 17 years. Thus these disorders may influence boys' self-esteem more markedly than girls'.

In girls it was possible to define a cut-point of 25 in the Rosenberg's Self-esteem Scale for low self-esteem to predict depression and social phobia, but in boys it was possible to define the same cut-point for low self-esteem to predict depression but not social phobia. There are no earlier findings of gender difference in low self-esteem being a risk factor for social phobia. There are some studies that point out that low self-esteem may be a risk factor for depression among girls, but not among boys (Canals et al. 2002; Eberhart et al. 2006; Facio and Batistuta 2001; Palosaari et al. 1996; Pelkonen et al. 2003). This study, however, supported the earlier findings that low self-esteem is a risk factor for depression for both genders (MacPhee and Andrews. 2006; Orth et al. 2008). Self-esteem seems to affect girls' confidence in social situations more severely than boys', but to be equally harmful for both genders' mood.

Decrease in self-esteem mediated the association between social phobia and subsequent depression in boys. Decrease in self-esteem partially mediated the association between depression and later social phobia in girls. As hypothesized, social phobia and depression affected self-esteem differently depending on gender. Social phobia at age 15 years led to a decrease of self-esteem of boys but not girls, and depression at age 15 years led to a decrease of girls', but not boys,' self-esteem. These gender differences in the associations between social phobia and depression and self-esteem may be consequences of different attributions of self-esteem among boys and girls (Rosenberg 1965). Social phobia may have a stronger impact on male self-esteem because, according at least to studies in child and early adolescent populations, boys in general may orient more outwards from home and they may favour larger peer groups and have a more active role in social situations, while girls prefer extended dyadic relationships with one or two very good friend (Rose and Rudolph 2006). On the other hand depression is associated more directly with self-image, physical image of self (Hankin and Abrahamson 1999; Siegel et al. 1999) and perceived social acceptance of oneself. These attributes may have a more marked impact on the self-esteem of girls than boys, leading to a deterioration of social functioning (Eberhart et al. 2006).

Consistent with earlier adolescent general population studies (Katainen et al. 1999; La greca and Lopez 1998; Newman et al. 2007; Schraedley et al. 1999) there were significant gender differences in perceived social support, girls reporting higher perceived support than boys in all factors except the family factor. This concurs with earlier studies. Also,

there were some gender differences in patterns of how perceived support was associated with current social phobia, depression and comorbid social phobia and depression, girls reporting mostly more perceived social support outside the family. Unlike among boys, low perceived support from friends was a risk factor for subsequent depression among girls. All in all girls perceive more support outside the family and friends seem to be a more important source of support for girls in middle adolescence than for boys. Likewise in earlier studies girls turn more to their friends when seeking help in coping with stress (Rose and Rudolph, 2006), and care more about others' opinions of themselves in peer groups than boys (Gavin et al. 1989).

6.9 Course of social phobia and depression in middle adolescent girls and boys

In this study, in girls at age 15 years depression was frequent and comorbidity was already quite common, as has been found in earlier general population studies (Essau et al. 1999; Kessler et al. 2001; Lewinsohn et al. 1998; Ranta et al. 2009; Wittchen et al. 2000). In accordance with earlier findings low self-esteem (Canals et al. 2002; Eberhart et al. 2006; Palosaari et al. 1996; Pelkonen et al. 2003), decreasing further as well as low support from friends and significant others were associated with later depression (Bettge et al. 2008; Heponiemi et al. 2006; Schraedley et al. 1999). Furthermore, in this study, depression with decrease in self-esteem was one of the associated risk factors leading mostly to comorbid social phobia and depression, although some heterotypic continuity to social phobia without depression also occurred. However, in girls only part of the influence of depression on the emergence of later social phobia could be explained by decrease in self-esteem. There were also direct effects of depression and low self-esteem on subsequent social phobia. In addition, the development of comorbid social phobia or social phobia without depression may have other significant routes in girls than via a decrease in self-esteem.

In boys at age 15 years social phobia was more common than depression, social phobia also being a common disorder in earlier adolescent general population studies (Essau et al. 1999; Gren-Landell et al. 2009; Ranta et al. 2009; Shields 2004; Wittchen et al. 1999). As in earlier adult general population studies, social phobia in boys was associated with low self-esteem (Acarturc et al. 2009; Chartier et al. 1998), which continued decreasing. Furthermore, according to findings in this study decrease in self-esteem in turn led to

comorbid social phobia and depression during the next two years. Change from social phobia to pure depression was almost absent, and the prevalence of comorbid social phobia and depression increased. In addition to decrease in self-esteem during adolescence, lack of support from significant other increased the risk for depression.

One possible explanation for this different course of these disorders is that the connection between social phobia and depression develops differently according to developmental stages in adolescence. Thus the gender difference may be explained by the fact that girls mature earlier than boys. At age 15 comorbid social phobia and depression was more frequent among girls (51.7%) than among boys (27.9%). It is possible that girls have had earlier social phobia and already developed social phobia and depression by age 15. The average age of onset of social phobia is indeed before 15 years (Chartier et al. 1998; Wittchen et al. 1999), and the criteria for social phobia have not been constantly fulfilled in follow-ups in earlier studies (Wittchen and Fehm 2003). The course of depression in adolescence does differ according to sex (Kessler et al. 2001), and is also reported to be related to pubertal timing (Conley and Rudolph 2009). However, this theory is contradicted by the very rare heterotypic course from social phobia without depression to depression without social phobia in follow-up found in this study.

One of the hypotheses of the development of comorbidity is that the first disorder is an independent risk factor for the second disorder (Kessler et al. 1999; Merikangas et al. 1996). In light of the present study this hypothesis could be valid only concerning depression as a risk factor for subsequent social phobia in girls. In girls social phobia was not associated with later depression, and was not an independent risk factor for depression. In boys this was not true in either way, because depression was not associated with subsequent social phobia and similarly social phobia was not associated with later depression if decrease in self-esteem was added into the analyses. The hypothesis that both social phobia and depression are consequences of the same shared risk factors was not supported by these results. Low self-esteem was a risk factor for both social phobia and depression in girls, but not in boys. Low perceived social support was only associated with later depression but not with later social phobia or comorbid depression and social phobia. However, there could, of course, be other factors acting as shared risk factors. The hypothesis that social phobia and depression are the same disease with different phenotypes at different phases of adolescent development or during the course of illness (Merikangas et al. 1996; Montgomery 1999) was contradicted in this study by the almost total absence of heterotypic continuity from social phobia to depression. The hypothesis that the first disorder causes demoralisation which, in turn leads to subsequent disorders

was best supported by the findings of the present study, especially concerning the development of comorbid social phobia and depression among boys. Social phobia leads to a decrease in self-esteem, which in turn leads to comorbid depression. This may also be the case among girls, but deterioration of self-esteem could not be considered the only mediating factor. There may be other mediating factors outside the issues studied in the present study in the development of subsequent (comorbid) social phobia among girls with depression.

The findings of the present study lend some support to the possibility that comorbid social phobia and depression is a diagnostic entity that differs qualitatively from social phobia and depression occurring simultaneously, because low social support from outside the family was not found to be a risk factor for comorbid social phobia and depression, although it predicted subsequent depression without social phobia. It also may be that there are different kinds of disorders classified as comorbid, of which some proportion is truly comorbid social phobia and depression and some are independent syndromes of their own with symptoms of depression and social phobia.

There are effective pharmacological and psychosocial interventions for social phobia, (Bögels and Mansell 2004; Garcia-Lopez et al. 2006; Khalid-Khan et al. 2007; Warner et al. 2007), and depression (Birhamer et al. 2007; Kessler et al. 2001; Lewinsohn et al. 1998; Young et al. 2010). The importance of the awareness of comorbidity between social phobia and depression is emphasized by the finding that by treating childhood anxiety disorders secondary depression outcomes uniformly showed improvement (Costello et al. 2002). Kessler et al. (1999) noted that roughly 10% of mood disorders might be prevented by successful early intervention in social phobia. This awareness of comorbidity is further emphasized by the findings that depressives with social phobia have twice as many impairments and two-thirds more episodes than depressives without social phobia (Kessler et al. 1999) Costello et al. (2002) suggested that focused interventions with generalized social phobias could well reduce the point prevalence of seriously impairing mood disorders by as much as one-fourth. Clinicians should bear in mind that individuals with social phobia rarely report their phobic symptoms spontaneously, and these symptoms should be elicited (Moutier and Stein 1999).

6.10 Methodological consideration, strengths and limitations

The present study enhanced our knowledge of the development social phobia, depression and of comorbidity between social phobia and depression, as well as of the role of low self-esteem and perceived social support in this development. It was based on a large general population sample of the same age cohort. The cohort can be considered representative because the coverage of compulsory comprehensive school until age 16 in Finland is more than 99%. The response rate the Adolescent Mental Health Cohort baseline survey was good.

The present study used a prospective longitudinal design also allowing causal interpretations. Samples of general population should be used especially in epidemiological studies on children or adolescents, and on disorders where treatment seeking is low as it is in both of the disorders studied (Costello et al. 2005). One major caveat of large epidemiological studies is confounding factors, which affects results. In the present study several covariates relevant to issues studied, such as, age, socioeconomic status, family structure, and externalizing behaviour, were controlled for.

The study sample was homogenous regarding age concerning the period from the beginning to the end of the middle adolescence. Middle adolescence is the main developmental phase with significant changes in social relationships, and is associated with the onset both disorders studied. The use of mixed samples of both children and adolescents in studies of risk factors in depression has been criticized because the prevalence of depression increases markedly during transition from childhood to adolescence (Costello et al. 2003; Ford et al. 2003; Newman et al. 1996). The same increase in prevalence is also true in social phobia (Weiller et al. 1996; Wittchen and Fehm 2003).

The lack of diagnostic interviews is another limitation. In the large general population study there were no resources for diagnostic interview. Social phobia and depression measured by questionnaires did not signify a clinical condition but was the adolescents' self-reported symptoms in general population. However, self-rating scales used the present study are well-known. Reliability and validity of the Social Phobia inventory has shown to be good in adolescent general population (Johnson et al. 2006; Ranta et al. 2007) and of the 13-item Beck Depression Inventory in adolescent clinical setting (Bennett et al. 1997) and an appropriate instrument measuring depressive symptomatology in adolescent general population studies (Kaltiala-Heino et al. 1999; Raitasalo 2007). Reliability could be

defined as the extent to which the results are consistent over time and an accurate representation of the population under study. Validity means that research instrument measures that which it is meant measure (Golafshani 2003). Adolescents have been shown to be able to report reliably on their health in certain psychological disorders (Smith et al. 2000).

The relatively large proportion (36.9%) of drop-outs at follow-up is a limitation. Dropping out from T2 data collection was related to depression at T1 and the dropout may result in underestimation of the prevalence rates presented. Twice as many boys as girls dropped out. This may have an impact on the results of gender differences. However, it is unlikely, that these affect the findings about the course of the disorders studied and associations between these two disorders and the variables studied. It should lead to cautiousness in the interpretation of some results, for example the prevalence of depression in the present study. However, Van Loon et al. (2003) stated that even though drop-out may affect prevalence estimates, there is no particular reason to assume that this would influence the associations between the phenomena studied (Van Loon et al. 2003).

Although the sample at baseline was large, especially in the comorbid social phobia and depression group, a larger sample of affected boys could have had more power for reaching statistical significance. This may affect the results of studies III and IV. This does not, however, affect the main result of the study III, that association between social phobia and depression is mediated by decrease in self-esteem. In the study IV perceived low social support being a risk factor should bear this possible limitation in mind when interpreting the results. In the study IV the non-gaussian distribution indicates that logistic regression may not give accurate results. However, logistic regression must be used to control the effects of covariates. Controlling the effects of covariates was considered as essential for this study. Tabachnick and Fidell (2005) have pointed out that logistic regression could be used in large samples even if the distribution of the measure is non-gaussian (Tabachnick and Fidell 2005).

A further limitation is the lack of information about any other potentially confounding psychiatric disorders and information on possible interventions in disorders before T1 or between T1 and T2. These factors may have some effect on the results. However, many important covariates were controlled for in this study, including externalizing behaviour. Earlier studies have also been limited to associations between social phobia and depression (Beidel et al. 1999; Bittner et al. 2004; Ranta et al. 2009; Stein et al. 2001; Wittchen et al. 1999). Likewise in this study the interest was to explore the development

of the comorbidity between these two disorders, and it was not deemed feasible to include further disorders in the analyses. Also, the proportion of individuals seeking and receiving treatment for mental disorders in this age group is low. Of the individuals in our sample classified as depressed at baseline 20% had sought help for depression by follow-up (Fröjd et al. 2007).

6.11 Clinical implications

Clinicians should be aware of social phobia and in their practice should routinely ask adolescents about the symptoms of social phobia, especially if they suffer from depression. In school settings there should be routines to identify and to help adolescents with social phobia. This may lead to the prevention of depressive disorders among adolescents. Likewise routines to identify and help adolescents with depression may lead to the prevention of social phobia among adolescents.

Clinicians should remember that in adolescence disorders also have their developmental course. Instead of evaluating only the current syndromes, the clinician should evaluate in what kind of disease process their adolescent patient is and plan intervention according this process. The clinician should remember that among girls current depression may lead to social phobia and among boys current social phobia may lead to depression.

The Rosenberg Self-esteem Scale is a suitable instrument to measure low self-esteem indicating the risk for social phobia and depression in the prevention of these disorders, for example in school health examinations. Self-esteem should be a central focus in preventive and in treatment interventions of both social phobia and depression. For example, pupils' self-esteem should be emphasized in school as a part of educational strategies, and teachers' awareness of issues associated with female and male self-esteem should be enhanced.

Supporting adolescents to create social connections and enhancing the use of social support, especially outside of the family, should be included in interventions for depression among adolescents.

Stigmatization must be bared in mind when evaluating adolescent with mental health problems. False diagnoses must be avoided, and caution must be taken when evaluating risk factors and early symptoms. Intervention should be carried out as near the

adolescents every-day life as possible in easy-access possibility to avoid stigmatization and to make it easier to participate in treatment. Also novel internet-based services like Mielenterveystalo.fi are important for providing easy and non-stigmatizing possibility for reaching help for mental health problems, especially for adolescents.

6.12 Implications for future research

The present study contributed to what is known about the developmental pathology and developmental epidemiology of two major internalizing disorders in middle adolescence, social phobia and depression.

More prospective general population based studies with multiple follow-up measures are needed for further understanding the development of social phobia and depression during different phases of adolescence. More studies on risk factors, such as bullying and disruptions in family structure, are needed to create a more comprehensive model of the development of social phobia. More studies on decrease in self-esteem as a potential mediating factor between those risk factors and the development of social phobia, depression and comorbid social phobia and depression are needed to form models of development of these disorders. These risk factors may be culture-bound, therefore, more studies are needed to explore models with psychosocial risk factors among adolescents with different cultural backgrounds.

Studies on possible independent comorbid syndromes are needed. Further studies are needed to replicate the findings of the present study in other comorbid disorders, such as anorexia nervosa and depression or ADHD and internalizing or other externalizing disorders. These studies should concern especially gender differences in the course of comorbidity, and decrease in self-esteem as a potential mediating factor in the development of their comorbidity.

This study emphasized the importance of confounding factors in epidemiological studies, and attention should be paid to choosing relevant covariates to be controlled for. This study further emphasized that gender differences are marked in adolescence, and reports of girls and boys should be analysed separately.

To better understand the developmental psychopathology and disorder processes from childhood through adolescence to adulthood research is needed on other disorders of

importance in adolescence, such as conduct disorders, psychoses and substance abuse disorders. One method in longitudinal research on the development of different disorders from the symptoms of social phobia, depression, as well as other psychiatric disorders measured by self-rating questionnaires is to use register data, for example, on the conclusions of out- and inpatient care (HILMO). In-patient registers, for example the Finnish Hospital Discharge Register (Perälä et al. 2007), may be reliable for studying psychotic disorders, but they are likely to be biased for studying non-psychotic disorders such as social phobia or depression (Mäki et al. 2014). Registers from schools, the legal system or mortality registers could be used for additional information in further studies.

7 Summary and conclusions

Social phobia and depression as measured by self-report questionnaires are common in adolescence. They are highly comorbid with each other. Low self-esteem is a risk indicator for depression and decrease in self-esteem plays an important role in the association between social phobia and depression. Low perceived social support from outside an adolescent's family is a risk factor for later depression. The prevalence, course and risk factors of social phobia and depression, and the associations between them include many gender differences in middle adolescence.

The conclusions of the studies are:

- Social phobia without depression at age 15 years was associated with increased risk for depression at age 17 years in boys, but not in girls. Social phobia seems to increase the risk for subsequent depression in boys. (Study I).
- Depression without social phobia at age 15 was associated with social phobia at age 17 in girls but not in boys. Depression seems to increase the risk for subsequent social phobia in girls. (Study I).
- Low self-esteem measured by the Rosenberg Self-esteem Scale with a cut-point of 25 could be used as an indicator for risk for social phobia and depression in girls and depression in boys. The Rosenberg Self-Esteem Scale is likely to be a useful instrument for assessing risk for social phobia in girls and depression in girls and boys (Study II).
- Decrease in self-esteem mediated the association between social phobia and subsequent depression among boys, and partially mediated the association between depression and subsequent social phobia among girls. Decrease in self-

esteem seems to play a decisive role in the association between social phobia and depression. (Study III).

- Low perceived social support from significant other at age 15 was associated with depression at age 17 in both genders. Among girls, low perceived support from friends was also associated with depression two years later. Low perceived social support from any source did not predict social phobia or comorbid social phobia and depression. Low perceived support from significant other seems to be a risk factor for depression in both genders and low perceived support from friends an additional risk factor for depression in girls. (Study IV).

There was a lack of prospective adolescent general population studies on the association between social phobia and depression, especially on the psychosocial risk factors and gender differences in these associations.

As a conclusion of this study, the development of social phobia, depression and comorbid social phobia and depression differs by gender. In girls low self-esteem and low perceived support from outside the family are risk factors for depression. Depression causes further decrease in self-esteem and this in turn, together with depression itself, and with other possible risk factors, leads to the development of comorbid social phobia. Among boys social phobia leads to decrease in self-esteem. Decrease in self-esteem, in turn, leads to the development of subsequent depression. Another risk factor for depression in boys is low perceived support from significant other.

Of the hypotheses about the development of comorbidity between social phobia and depression the deterioration theory of comorbidity seems most valid among boys, but among girls the development of comorbidity is more complicated. Perceived social support is associated differently with pure depression and comorbid depression. Comorbid social phobia and depression may be a syndrome other than social phobia and depression presenting concurrently.

7.1 Practical implications

Social phobia and depression should be evaluated in school health examinations and symptoms of social fears and in clinical practice possible depression should also be actively elicited among adolescents. Perceived social support should be evaluated. Preventive and treatment interventions should include creating opportunities for social support and enhancing adolescents' ability to utilize it. Self-esteem should be assessed in the clinical settings of school health services and strategies should be developed to help families, teachers, sports coaches etc. to support self-esteem in the everyday context in families, schools and in the leisure activities of adolescents to prevent adolescent social phobia and especially depression. Enhancing self-esteem should be a central focus of psychosocial interventions for social phobia and depression among adolescents.

7.2 Implications for further study

Other risk factors, such as bullying and disruptions in family structure, should be studied to create a more comprehensive model of the development of social phobia. More studies on decrease in self-esteem as a potential mediating factor between those risk factors and the development of social phobia, depression and comorbid social phobia and depression are needed to construct models of the development of these disorders.

8 Acknowledgements

This study was carried out at the University of Tampere, School of Medicine. I wish to express my gratitude to the head of the School of Medicine for the facilities the institution provided. This study is part of the Adolescent Mental Health Cohort, which is contributed by the University of Tampere, the School of Public Health and the School of Medicine, and the National Institute for Health and Welfare. I am grateful to the head of the School of Public Health, the head of the School of Medicine of Tampere University, and to the head of the National Institute for Health and Welfare, Department of Mental Health and Alcohol research for the opportunity to take part in the Adolescent Mental Health Cohort. I am grateful to the Pirkanmaa Hospital District Research Fund for supporting this study.

I am most grateful to my supervisors for their essential support for my work. Without their immense help this work could not have been possible. Professor Riittakerttu Kaltiala-Heino offered me the opportunity to take part in the Adolescent Mental Health Project. She offered guidance in all aspects of scientific work during the phases of this study. I am especially grateful for her for clearing my thoughts about this research and for her support in learning clear expression in scientific writing. Professor Mauri Marttunen contributed to all aspects of this study as well. I am grateful to him for having taught me so much about epidemiology, methods of epidemiological research and especially for helping me to learn about scientific writing.

I wish to thank my follow-up group, Adjunct Professor Mirjami Pelkonen and Adjunct Professor Bettina von der Pahlen for their valuable contribution to my work.

I express my appreciation to the reviewers of this thesis, Professor Pirjo Mäki and Adjunct Professor Jani Penttilä for their extremely important and valuable constructive criticism for this work. Both of them gave me many important suggestions, which enhanced markedly the quality of this work. I warmly thank Virginia Mattila MA for checking and correcting the grammar of the present work.

I am grateful to the Adolescent Mental Health Cohort group for constructive discussions about this study and scientific themes in general. I have learnt a lot from these discussions.

Especially I want to thank Sari Fröjd D.Sc. for her scientific consultation and constructive criticism of my work as a co-author and a member of the research group. I want to thank Klaus Ranta MD for his immense contribution to this work as a co-writer and for important scientific consultation. I am thankful to Rasmus Isomaa DPhil for his extensive contribution to my work as a co-author and for scientific consultation.

I warmly thank former chief psychiatrist Päivi Rantanen and chief of the department of psychiatry of Tampere University Hospital Klaus Lehtinen for their fundamental help for me in my first steps in researching and for later encourage in my research. I thank Professor of social psychiatry, Matti Joukamaa for learning scientific writing and for important tips concerning publishing in scientific papers.

I am grateful to Mika Helminen MSc for essential help in answering my statistical queries. I learned a great deal about statistical methods and about using statistical data programs from the discussions with him about these subjects.

I want to thank all the adolescents who participated to this study.

I thank my mother Anja for supporting me in my career leading to the publication of this work. I thank my sister Pirjo Mutanen and my brother Kimmo being encouraging examples. I thank my three children bringing light into my life and giving me positive energy to carry on. I thank their mother. I thank for Milla for her patience when I worked at home listening radio.

Finally, I thank my beloved Eija for her love and support.

9 References

- Aalberg V and Siimes MA (2007): Lapsesta aikuiseksi: nuoren kypsyminen mieheksi tai naiseksi. 2nd ed. Gummerus, Jyväskylä.
- Abela JRZ and Hankin BL (2011): Rumination as a vulnerability factor to depression during the transition from early to middle adolescence: A multiwave longitudinal study. *J Abnorm Psychol* 120:259-271.
- Acarturc C, Smit F, de Graaf R, van Straten A, ten Have M and Cuijpers P (2009): Incidence of social phobia and identification of its risk indicators: a model for prevention. *Acta Psychiatr Scand* 119:62-70.
- Achenbach TM (1991): Manual for the Child Behavior Checklist/4-18 and 1991 profile. VT: University of Vermont Department of Psychiatry, Burlington.
- Alden LE and Mellings TMB (2004): Generalized Social Phobia and social judgments: the salience of self- and partner information. *J Anxiety Disord* 18:143-157.
- Alfano CA, Beidel DC and Turner SM (2006): Cognitive correlates of social phobia among children and adolescents. *J Abnorm Child Psychol* 35:189-201.
- Alfano CA, Beidel DC and Turner SM (2008): Negative self-imagery among adolescents with social phobia: a test of an adult model of the disorder. *J Clin Child Adolesc Psychol* 37:327-336.
- Algood-Merten B, Lewinsohn PM and Hops H (1990): Sex differences and adolescent depression. *J Abnorm Psychol* 99:55-63.
- Alpert JE, Fava M, Uebelacker LA, Nierenberg AA, Pava JA, Worthington III JJ and Rosenbaum JF (1999): Patterns of axis I comorbidity in early-onset versus late-onset major depressive disorder. *Biol Psychiatry* 46:202-211.

- Alsaker FD and Olweus D (1993): Global self-evaluations and perceived instability of self in early adolescence: a cohort longitudinal study. *Scand J Psychol* 34:47-63.
- American Psychiatric Association (APA) (1995): *Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) International version*. American Psychiatric Association, Washington DC.
- Angold A and Costello EJ (1993): Depressive comorbidity in children and adolescents: Empirical, theoretical and methodological issues. *Am J Psychiatry* 150:1779-1791.
- Angold A, Costello EJ and Worthman CA (1998): Puberty and depression: the roles of age, pubertal status and pubertal timing. *Psychol Med* 28:51-61.
- Angold A, Costello EJ and Erkanli A (1999): Comorbidity. *J Child Psychol Psychiatry* 40:57-87.
- Appleyard K, England B and Sroufe LA (2007): Direct social support for young high risk children: Relations with behavioral and emotional outcomes across time. *J Abnorm Child Psychol*. 35:443-457.
- Aseltine RH Jr., Gore S and Colten ME (1994): Depression and the social developmental context of adolescence. *J Pers Soc Psychol* 67:252-263.
- Avenevoli S and Steinberg L (2001): The continuity of depression across the adolescent transition. *Adv Child Dev Behav* 28:139-173.
- Baron RM and Kenny DA (1986): The moderator-mediator variable distinction in social psychological research: Conceptual, Strategic, and statistical considerations. *J Pers Soc Psychol* 51:1173-1182.
- Beck A and Beck R (1972): Screening depressed patients in family practice. A rapid technic. *Postgrad Med* 52:81-85.
- Beck A, Rial W and Rickels K (1974): Short form of depression inventory: cross-validation. *Psychol Rep* 34:1184-1186.

- Beesdo K, Bittner A, Pine DS, Stein MB, Hofler M, Lieb R and Wittchen HU (2007): Incidence of social anxiety disorder and the consistent risk for secondary depression in the first three decades of life. *Arch Gen Psychiatry* 64:903-12.
- Beidel DC, Turner SM and Morris TL (1999): Psychopathology of childhood social phobia. *J Am Acad Child Adolesc Psychiatry* 38:643-650.
- Bennett DS, Ambrosini PJ, Bianchi M, Barnett D, Metz C and Rabinovich H (1997): Relationship of Beck depression inventory factors to depression among adolescents. *J Affect Disord* 45:127-134.
- Bettge S, Wille N, Barkmann C, Schulte-Markwort M, Ravens-Sieberer U and the BELLA study group (2008): Depressive symptoms of children and adolescents in a German representative sample: results of the BELLA study. *Eur Child Adolesc Psychiatry* 17(Suppl 1):71-81.
- Betts J, Gullone E and Allen S (2009): An examination of emotion regulation, temperament and parenting style as potential predictors of adolescent depression risk status: A correlational study. *Br J Dev Psychol* 27:473-485.
- Biederman J, Faraone S, Mick E and Lelon E (1995): Psychiatric comorbidity among referred juveniles with major depression: Fact or artefact. *J Am Acad Child Adolesc Psychiatry* 34:579-590.
- Birhamer B, Brent D, Bernet W, Bukstein O and Walter H (2007): Practise parameter for the assessment and treatment of children and adolescents with depressive disorder. *J Am Acad Child Adolesc Psychiatry* 46:1503-1526.
- Biro FM, Striegel-Moore RH, Franko DL, Padgett J and Bean JA (2006): Self-esteem in adolescent females. *J Adolesc Health* 39:501-507.
- Bittner A, Goodwin RD and Wittchen HU (2004): What characteristics of primary anxiety disorders predict subsequent major depressive disorder? *J Clin Psychiatry* 65:618-626.
- Blakemore SJ (2012): Imaging brain development: The adolescent brain. *Neuroimage* 61:397-406.

- Blos P (1962): *On adolescence: a psychoanalytic interpretation*. Free Press, New York.
- Blumenthal JA, Burg MM, Barefoot J, Williams RB, Haney T and Zinet G (1987): Social support, type A behavior, and coronary artery disease. *Psychosom Med* 49:331-340.
- Bruwer B, Emsley R, Kidd M, Loehner C and Seedat S (2008): Psychometric properties of the Multidimensional Scale of Perceived Social Support in youth. *Compr Psychiatry* 49:195-201.
- Burke RJ and Weir T (1978): Sex difference in adolescent life stress, social support, and well-being. *J Psychol* 98:277-288.
- Button EJ, Loan P, Davies J and Sonuga-Barke EJS (1997): Self-esteem, eating problems, and psychological well-being in a cohort of schoolgirls aged 15-16: A questionnaire and interview study. *Int J Eat Disord* 21:39-47.
- Bögels SM and Mansell W (2004): Attention processes in the maintenance and treatment of social phobia: hypervigilance, avoidance and self-focused attention. *Clin Psychol Rew* 24:827-856.
- Canals J, Domènech-Llaberia E, Fernández-Ballart J and Martí-Henneberg C (2002): Predictors of depression at eighteen A 7-year follow-up study in a Spanish nonclinical population. *Eur Child Adolesc Psychiatr* 11:226-233.
- Caron C and Rutter M (1991): Comorbidity in child psychopathology, issues and research strategies. *J Child Psychol Psychiatry* 32:1063-1680.
- Chartier MJ, Hazen AL and Stein MB (1998): Lifetime patterns of social phobia: a retrospective study of the course of social phobia in a nonclinical population. *Depress Anxiety* 7:113-121.
- Chavira DA, Stein MB, Bailey K and Stein MT (2004): Comorbidity of generalized social anxiety disorder and depression in a pediatric primary care sample. *J Affect Dis* 80:163-171.

- Cheng C (1998): Getting the right kind of support: Functional differences in the types of social support on depression for chinese adolescents. *J Clin Psychol* 54: 845-849.
- Cohen J (1992): A power primer. *Psychol Bul.* 112:155-159.
- Colver A and Longwell S (2013): New understanding of adolescent brain development: relevance to transitional healthcare for young people with long term conditions. *Arch Dis Child* 98: 902-907.
- Conley CS and Rudolph KD (2009): The emerging sex difference in adolescent depression: interacting contribution of puberty and peer stress. *Dev. Psychopathol.* 21:593-620.
- Connor KM, Davidson JRT, Churchill LE, Sherwood A, Foa E and Weisler RH (2000): Psychometric properties of the Social Phobia Inventory (SPIN): new self-rating scale. *Br J Psychiatry* 176:379-386.
- Connor JM, Poyrazli S, Ferrer-Wreder L and Grahame KM (2004): The relation of age, gender, ethnicity, and risk behaviors to self-esteem among students in nonmainstream schools. *Adolescence* 39:457-474.
- Copeland W, Shanahan L, Costello J and Angold A (2011): Cumulative prevalence of psychiatric disorders by young adulthood: A prospective cohort analysis from the Great Smoky Mountains study. *J. Am Acad Child Adolesc Psychiatry* 50:252-261.
- Costello EJ, Pine DS, Hammen C, March JS, Plotsky PM, Weissman MM, Biederman J, Goldsmith HH, Kaufman J, Lewinsohn PM, Hellander M, Hoagwood K, Koretz DS, Nelson CA and Leckman JF (2002): Development and natural history of mood disorders. *Biol Psychiatry* 52:529-542.
- Costello EJ, Mustillo S, Erkanli A, Keeler G and Angold A (2003): Prevalence and development of psychiatric disorders in childhood and adolescence. *Arch Gen Psychiatry* 60:837-844.
- Costello EJ, Egger H and Angold A (2005): 10-year research update review. The epidemiology of child and adolescent psychiatric disorders: I Methods and public health burden. *J. Am Acad Child Adolesc Psychiatry* 44:972-986.

- Costello EJ, Foley DI and Angold A (2006): 10-Year research update review: The epidemiology of child and adolescent psychiatric disorders: II Developmental epidemiology. *J. Am Acad Child Adolesc Psychiatry* 45:8-25.
- Costello DM, Swendsen J, Rose JS and Dierker LC (2008): Risk and protective factors associated with trajectories of depressed mood from adolescence to early adulthood. *J Consult Clin Psychol.* 76:173-183.
- Costello EJ, Copeland W and Angold A (2011): Trends in psychopathology across the adolescent years: What changes when children become adolescents, and when adolescents become adults? *J Child Psychol Psychiatry* 52:1015-1025.
- Coughlan H, Tiedt L, Clarke M, Kelleher I, Tabish J, Molloy C, Harley M and Cannon M (2014): Prevalence of DSM-IV mental disorders, deliberate self-harm and suicidal ideation in early adolescence: An Irish population-based study. *J Adolesc* 37:1-9.
- Cramer V, Torgersen S and Kringlen E (2005): Quality of life and anxiety disorders: A population study. *J Nerv Ment Dis* 193:196-202.
- Culbertson JL, Newman JE and Willis DJ (2003): Childhood and adolescent psychologic development. *Pediatr Clin N Am* 50:241-764.
- Daws LC and Gould GG (2011): Ontogeny and regulation of the serotonin transporter: Providing insights into human disorders. *Pharmacol Ther* 131:61-79.
- Dell'osso L, Saettoni M, Papisogli A, Rucci P, Ciapparelli A, Di Poggio AB, Ducci F, Hardoy C and Cassano GB (2002): Social anxiety spectrum: gender differences in Italian high school students. *J. Nerv. Ment. Dis.* 190:225-232.
- Denny S, Clark TC, Fleming T and Wall M (2004): Emotional resilience: Risk and protective factors for depression among alternative education students in New Zealand. *Am J Orthopsych* 74:137-149.
- DeWit DJ, Chandler-Coutts M, Offord DR, King G, McDougall J, Specht J and Stewart S (2005): Gender differences in the effects of family adversity on the risk of onset of DSM-3-R social phobia. *Anxiety Disord* 19:479-502.

- Duggal S, Carlson EA, Sroufe LA and Egeland B (2001): Depressive symptomatology in childhood and adolescence. *Development and Psychopathology* 13:143-164.
- Dukes RL and Martinez R (1994): The impact of ethnicity on self-esteem among adolescents. *Adolescence* 29:105-116.
- Dumont M and Provost MA (1999): Resilience in Adolescents: Protective role of social support, coping strategies, self-esteem, and social activities on experience of stress and depression. *J Youth Adolescence* 28:343-363.
- Eberhart NK, Shih JH, Hammen CL and Brennan PA (2006): Understanding the sex difference in vulnerability to adolescent depression: an examination of child and parent characteristics. *J Abnorm Child Psychol* 34:495-508.
- Eng W, Heimberg RG, Coles ME, Schneier FR and Liebowitz MR (2000): An empirical approach to subtype identification in individuals with social phobia. *Psychol med* 30:1345-1357.
- Erath SA, Flanagan KS and Bierman KL (2007): Social anxiety and peer relations in early adolescence: Behavioral and cognitive factors. *J Abnorm Child Psychol* 35:405-416.
- Erikson E (1968): *Identity, youth and crisis*. Faber & Faber, London.
- Essau CA, Conradt J and Petermann F (1999): Frequency and comorbidity of social phobia and social fears in adolescents. *Behav Res Ther* 37:831-843.
- Ezzell CE, Swenson CC and Brondino MJ (2000): The relationship of social support to physically abused children's adjustment. *Child Abuse Negl* 24:641-651.
- Facio A and Batistuta M (2001): What makes Argentinian girls unhappy? A cross-cultural contribution to understanding gender differences in depressed mood during adolescence. *J Adolescence* 24:671-680.
- Fergusson DM and Horwood LJ (2001): The Christchurch Health and Development Study: review of findings on child and adolescent mental health. *Aust N Z J Psychiatry*. 35(3):287-96.

- Fergusson DM, Horwood LJ, and Lynskey MT (1993): prevalence and comorbidity of DSM-III-R diagnoses in a birth cohort of 15 years olds. *J. Am Acad Child Adolesc Psychiatry* 30:79-85.
- Fergusson DM, Lynskey MT and Horwood LJ (1996): Origins of Comorbidity between Conduct and Affective Disorders. *J Am Acad Child Adolesc Psychiatry* 35:451-460.
- Fergusson DM, Beautrais AL and Horwood LJ (2003): Vulnerability and resiliency to suicidal behaviours in young people. *Psychol Med* 33:61-73.
- Foley DL, Craig JM, Morley R, Olsson CJ, Dwyer T, Smith K and Saffery R (2009): Prospects for epigenetic epidemiology. *Am J Epidemiol* 169:389-400.
- Ford T, Goodman R and Meltzer H (2003): The British child and adolescent mental health survey: the prevalence of DSM-IV disorders. *J Am Acad Child Adolesc Psychiatry* 42:1203-1211.
- Fountoulakis KN, Iacovides A, Kleanthou S, Samolis S, Gougoulas K, St Kaprinis G and Bech P (2003): The Greek translation of the symptoms rating scale for depression and anxiety: preliminary results of the validation study. *BMC Psychiatry* 3:1-8.
- Fröjd S, Marttunen M, Pelkonen M, von der Pahlen B and Kaltiala-Heino R (2007): Adult and peer involvement in help-seeking for depression in adolescent population A two year follow-up in Finland. *Soc Psychiatry Psychiatry Epidemiol* 42:945-952.
- Garcia-Lopez LJ, Olivares J, Beidel D, Albano AM, Turner S and Rosa AI (2006): Efficacy of three treatment protocols for adolescents with social phobia: A 5-year follow-up assessment. *J Anxiety Disord* 20:175-191.
- Garnefski N (2000): Age differences in depressive symptoms, antisocial behaviour and negative perceptions of family, school, and peers among adolescents. *J Am Acad Child Adolesc Psychiatry* 39:1175-1181.
- Gavin LA, Furman G and Furman W (1989): Age differences in adolescents' perceptions of their peer groups. *Dev. Psychol.* 25:827-834.

- Ge X, Conger RD and Elder Jr. GH (2001): Pubertal transition, stressful life events, and the emergency of gender differences in adolescent depressive symptoms. *Dev Psychol* 37:404-417.
- Gladstone GL, Parker GB, Mitchell PB, Wilhelm KA and Mahli GS (2005): Relationship between self-reported childhood behavioral inhibition and lifetime anxiety disorders in a clinical sample. *Depress Anxiety* 22:103-113.
- Golafshani N (2003): Understanding reliability and validity in qualitative research. *The Qualitative Report* 8:597-607.
- Goodwin RD, Fergusson DM and Horwood LJ (2004): Early anxious/withdrawn behaviours predict later internalizing disorders. *J Child Psychol Psychiatry* 45:874-883.
- Gren-Landell M, Tillfors M, Furmark T, Bohlin G, Andersson G and Svedin CG (2009): Social phobia in Swedish adolescents, prevalence and gender differences. *Soc Psychiatry Psychiatr Epidemiol* 44:1-7.
- Gyllenberg D, Sourander A, Niemelä S, Helenius H, Sillanmäki L, Piha J, Kumpulainen K, Tamminen T, Moilanen I and Almqvist F (2010): Childhood predictors of later psychiatric hospital treatment: findings from the Finnish 1981 birth cohort study. *Eur Child Adolesc Psychiatry*. 19:823–833.
- Haarasilta L, Marttunen M, Kaprio J and Aro H (2001): The 12-month prevalence and characteristics of major depressive episode in a representative nationwide sample of adolescents and young adults. *Psychol Med* 31: 1169-1179.
- Hankin BL (2009): Development of sex differences in depressive and co-occurring anxious symptoms during adolescence: Descriptive trajectories and potential explanations in a multiwave prospective study. *J Clin Child Adolesc Psychol* 38:460-472.
- Hankin BL and Abramson LY (1999): Development of gender differences in depression: description and possible explanations. *Ann Med* 31:372-379.

- Hankin BL, Abramson LY, Moffitt TE, Silva PA, McGee R and Angell KE (1998): Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Abnorm Psychol* 107:128-140.
- Harter S and Monsour A (1992): Development analysis of conflict caused by opposing attributes in the adolescent self-portrait. *Dev. Psychol.* 28:251-260.
- Harter S, Waters P and Whitesell NR (1998): Relational self-worth: differences in perceived worth as a person across interpersonal contexts among adolescents. *Child Dev* 69:756-766.
- Hedman AM, van Haaren NEM, Schnack HG, Kahn RS and Hulshoff Pol HE (2012): Human brain changes across the life span: A review of 56 longitudinal magnetic resonance imaging studies. *Human Brain Mapping* 33:1987-2002.
- Helstelä L and Sourander A (2001): Self-reported competence and emotional and behavioral problems in a sample of Finnish adolescents. *Nord J Psychiatry* 55:381-385.
- Heponiemi T, Elovainio M, Kivimäki M, Pulkki L, Puttonen S and Keltinkangas-Järvinen L (2006): The longitudinal effects of social support and hostility on depressive tendencies. *Soc Sci Med* 63:1374-1382.
- Hoffmann SG (2007): Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cogn Behav Ther* 36:193-209.
- Hosmer DW and Lemeshow S (2000): *Applied logistic regression*. 2nd ed. Wiley, New York NY.
- Izic F, Akyuz G, Dogan O and Kugu N (2004): Social phobia among university students and its relation to self-esteem and body image. *Can J Psychiatry* 49:630-634.
- Johnson HS, Inderbitzen-Nolan H and Anderson ER (2006): The Social Phobia Inventory: validity and reliability in an adolescent community sample. *Psychol Asses* 18:269-277.

- Jones DC (2004): Body image among adolescent girls and boys: A longitudinal study. *Dev Psychol* 40(5):823-835.
- Kaltiala-Heino R, Rimpelä M, Rantanen P and Laippala P (1999): Finnish modification of the 13-item Beck Depression Inventory in screening an adolescent population for depressiveness and positive mood. *Nord J Psychiatry* 53:451-457.
- Kaltiala-Heino R, Rimpelä M, Rantanen P and Laippala P (2001): Adolescent depression: the role of discontinuities in life course and social support. *J Affect Dis* 64:155-166.
- Kaltiala-Heino R, Marttunen M, Rantanen P and Rimpelä, M (2003): Early puberty is associated with mental health problems in middle adolescence. *Soc. Sci. Med.* 57:1055-1064.
- Karlsson L, Pelkonen M, Ruutu T, Kiviruusu O, Heilä H, Holi M, Kettunen K, Tuisku V, Tuulio-Henriksson A, Törrönen J and Marttunen M (2006): Current comorbidity among consecutive adolescent psychiatric outpatients with DSM-IV mood disorders. *Eur Child Adolesc Psychiatry* 15:220-231.
- Kashani JH, Beck NC, Hooper EW, Fallahi C, Corcoran CM, McAllister JA, Rosenberg TK and Reid JC (1987): Psychiatric disorders in a community sample of adolescents. *Am J Psychiatry* 144:584-589.
- Katainen S, Räikkönen K and Keltinkangas-Järvinen L (1999): Adolescent temperament, perceived social support and depressive tendencies in young adulthood. *Eur J Personal* 13:183-207.
- Kawachi I and Bergman LF (2001): Social ties and mental health. *J Urban Health* 78:458-467.
- Keller MB (2003): The lifelong course of social anxiety disorder: a clinical perspective. *Acta Psychiatr Scand* 108(Suppl 417):85-94.
- Kendler KS, Gardner CO and Prescott CA (2002): Toward a comprehensive developmental model for major depression in women. *Am J Psychiatry* 159:1133-1145.

- Kessler KS, Gardner CO and Prescott CA (2006): Toward a comprehensive developmental model for major depression in men. *Am J Psychiatry* 165:115-124.
- Kessler RC (2003): The impairments caused by social phobia in the general population: implications for intervention. *Acta Psychiatr Scand* 108(suppl 417):19-27.
- Kessler RC and Walters EE (1998): Epidemiology of DSM-III-R Major depression and minor depression among adolescents and young adults in the National Comorbidity Survey. *Depress Anxiety* 7:3-14.
- Kessler RC, McGonagle KA, Swartz M, Blazer DG and Nelson CI (1993) Sex and depression in the National Comorbidity Survey I: Lifetime prevalence, chronicity and recurrence. *J Affect Dis* 29:85-96.
- Kessler RC, Stein MB and Berglund P (1998): Social phobia subtypes in the National Comorbidity Survey. *Am J Psychiatr* 155:613-619.
- Kessler RC, Stang P, Wittchen HU, Stein M and Walters EE (1999): Lifetime comorbidities between social phobia and mood disorders in the US National Comorbidity Survey. *Psychol Med* 29:555-567.
- Kessler RC, Avenevoli S and Merikangas KR (2001): Mood disorders in children and adolescents: An epidemiologic perspective. *Biol Psychiatry* 49:1002-1014.
- Kessler RC, Avenevoli S, McLaughlin KA, J. Greif Green, Lakoma MD, Petukhova M, Pine DS, Sampson NA, Zaslavsky AM and Merikangas KR (2012): Lifetime co-morbidity of DSM-IV disorders in the US National Comorbidity Survey Replication Adolescent Supplement (NCS-A) *Psychol Med* 42:1997–2010.
- Khalid-Khan S, Santibanez MP, McMicken C and Rynn MA (2007): Social anxiety in children and adolescents Epidemiology, diagnosis and treatment. *Pediatr Drugs* 9:227-237.
- Kieling C, Baker-Henningham H, Belfer M, Conti G, Omigbodun O, Rohde LA, Srinath S, Ulkuer N and Rahman A (2011): Global mental health 2. Child and adolescent mental health worldwide: Evidence for action. *Lancet* 378:1515-1525.

- Kilb W (2011): Development of the GABAergic system from birth to adolescence. *Neurosci* 18:613-630.
- King RA (2002): Adolescence, in *Child and Adolescent Psychiatry* 3rd edition pp 332-342. Ed Lewis, Lippincott Williams & Williams, Philadelphia.
- Kling KC, Hyde JS, Showers CJ and Buswell BN (1999): Gender differences in self-esteem: a meta-analysis. *Psychol Bull* 125:470-500.
- Klomek AB, Sourander A, Kumpulainen K, Piha J, Tamminen T, Moilanen I, Almqvist F and Gould MS (2008): Childhood bullying as a risk for later depression and suicidal ideation among Finnish males. *J Affect Dis* 109:47-55.
- Knappe S, Beesdo K, Fehm L, Lieb R and Wittchen HU (2009): Association of familial risk factors for social fears and social phobia: evidence for the continuum hypothesis in social anxiety disorder? *J Neural Transm* 116:639-648.
- Koydemir S and Demir A (2008): Shyness and cognitions: An examination of Turkish university students. *J Psychol* 142:633-644.
- Ladouceur CD, Peper JS, Crone EA and Dahl RE (2012): White matter development in adolescence: The influence of puberty and implications for affective disorders. *Developmental Cognitive Neuroscience* 2:36-54.
- La Greca AM and Lopez N (1998): Social anxiety among adolescents: Linkages with peer relations and friendships. *J Ab Child Psychol* 26:83-94.
- Laufer M and Laufer ME (1984): *Adolescence and developmental breakdown. A psychoanalytic view.* Yale University Press. New Haven and London.
- Leary MR, Haupt AL, Strausser KS and Chokel JT (1998): Calibrating the sociometer: the relationship between interpersonal appraisals and state self-esteem. *J Pers Soc Psychol* 74:1290-1299.
- Lenroot RK and Giedd JN (2010): Sex differences in the adolescent brain. *Brain Cogn* 72:46-55.

- Lepine JP and Pelissolo A (2000): Why take social anxiety disorder seriously? *Depress Anxiety* 11:87-92.
- Lewinsohn PM, Rohde P, Seeley JR and Hops H (1991): Comorbidity of unipolar depression: I Major depression with dysthymia. *J Ab Psychol* 100:205-213.
- Lewinsohn PM, Hops H, Roberts RE, Seeley JR and Andrews JA (1993): Adolescent psychopathology: I. Prevalence and incidence of depression and other DSM-III-R disorders in high school students. *J Ab Psychol* 102:133-144.
- Lewinsohn PM, Gotlib IH and Seeley JR (1997a): Depression-related psychosocial variables: are they specific to depression in adolescents. *J Abnorm Psychol* 106(3):365-375.
- Lewinsohn PM, Zinbarg R, Seeley JR, Lewinsohn M and Sack WH (1997b): Lifetime comorbidity among anxiety disorders and other mental disorders in adolescents. *J Anxiety Disord* 11:377-394.
- Lewinsohn PM, Rohde P and Seeley JR (1998): Major depressive disorder in older adolescents: prevalence, risk factors, and clinical implications. *Clin Psychol Rev* 18:765-794.
- Lewinsohn PM, Rohde P, Klein DN and Seeley JR (1999): Natural course of adolescent major depressive disorder: I. Continuity into young adulthood. *J Am Acad Child Adolesc Psychiatry* 38:56-63.
- Lewinsohn PM, Rohde P, Seeley JR, Klein DN and Gotlib IH (2000): Natural course of adolescent major depressive disorder in community sample: Predictors of recurrence in young adults. *Am J Psychiatry* 157:1584-1591.
- Li SC (2012): Neuromodulation of behavioral and cognitive development across the life span. *Dev Psychol* 48:810-814.
- Lifrak PD, McKay JR, Rostain A, Alterman AI and O'Brien CP (1997): Relationship of perceived competencies, perceived social support, and gender to substance use in young adolescents. *J Am Acad Child Adolesc Psychiatry* 36:933-940.

- Lin HC, Tang TC, Yen JY, Ko CH, Huang CF, Liu BC and Yen CF (2008): Depression and its association with self-esteem, family, and school factors in a population of 9586 adolescents in southern Taiwan. *Psychiatry Clin Neurosci* 62:412-420.
- Liyanage VRB, Jarmasz JS, Murugesan N, Bigio MRD, Rategar M and Davie JR (2014): DNA modifications: Function and applications in normal and disease states. *Biology* 3:670-723.
- Luukkonen A-H, Riala K, Hakko H and Räsänen P, Study-70 workgroup (2010a): Bullying behavior and substance abuse among psychiatric inpatient adolescents. *Eur Psychiatry* 25:382-389.
- Luukkonen A-H, Räsänen P, Hakko H, Riala K and The STUDY-70 workgroup (2010b): Bullying behavior in relation to psychiatric disorders and physical health among adolescents: A clinical cohort of 508 underage inpatient adolescents in Northern Finland. *Psychiatry Res.* 178:166-170.
- Luukkonen A-H, Riala K, Hakko H and Räsänen P (2011): Bullying behavior and criminality: A population-based follow-up study of adolescent psychiatric inpatients in Northern Finland. *Forensic Sci Int.* 207:106-110.
- MacPhee AR and Andrews JJW (2006): Risk factors for depression in early adolescence. *Adolescence* 41:435-466.
- Magee WJ, Eaton WW, Wittchen HU, McGonagle KA and Kessler RC (1996): Agoraphobia, Simple Phobia, and Social Phobia in the National Comorbidity Survey. *Arch Gen Psych* 53:159-168.
- Manuzza S, Schneier FR, Chapman TF, Liebowitz MR, Klein DF and Fyer AJ (1995): Generalized social phobia: Reliability and validity. *Arch Gen Psych* 52:230-237.
- McClure AC, Tanski SE, Kingsbury J, Gerrad M and Sargent JD (2010): Characteristics associated with low self-esteem among US adolescents. *Academic Pediatrics* 10:238-244.

- McDonald KL, Bowker JC, Rubin KH, Rubin KH, Laursen B and Duchene MS (2010): Interactions between rejection sensitivity and supportive relationships in the prediction of adolescents' internalizing difficulties. *J Youth Adolescence* 39:563-574.
- McGee R, Feehan M, William S, Partridge F, Silva PA and Kelly J (1990): DSM-III disorders in a large sample of adolescents. *J Am Acad Child Adolesc Psychiatry* 29:611-619.
- McGuire S, Neiderhiser JM, Reiss D and Hetherington EM (1994): Genetic and environmental influences on perceptions of self-worth and competence in adolescence: A study of twins, full siblings and step-siblings. *Child Dev* 65:785-799.
- Merikangas KR, Whitaker A, Angst J, Eaton W, Canino G, Rubio-Stipec M, Wacker H, Wittchen HU, Andrade L, Essau C, Kraemer H, Robins L and Kupfer D (1996): Comorbidity and boundaries of affective disorders with anxiety disorders and substance misuse: Results of an International Task Force [Comorbidity of Mood Disorders]. *Br J Psychiatry* 168(suppl 30):58-67.
- Merikangas KR, Avenevoli S, Acharyya S, Zhang H and Angst J (2002): The spectrum of social phobia in the Zurich Cohort Study of Young Adults. *Biol Psychiatry* 51:81-91.
- Merikangas KR, He J-P, Burstein M, Swanson SA, Avenevoli S, Cui L, Benjet C, Georgiades K and Swendsen J (2010): Lifetime prevalence of mental disorders in U.S. adolescents: Result from the National Comorbidity Survey Replication – Adolescent Supplement (NCS-A): *J. Am Acad Child Adolesc Psychiatry* 49:980-989.
- Miettunen J, Murray GK, Jones PB, Mäki P, Ebeling H, Taanila A, Joukamaa M, Savolainen J, Törmänen S, Järvelin M-R, Veijola J and Moilanen I (2014): Longitudinal associations between childhood and adulthood externalizing and internalizing psychopathology and adolescent substance use. *Psychol Med.* 44:1727-38.

- Montgomery (1999): Social phobia: diagnosis, severity and implications for treatment. *Eur Arch Clin Neurosci* 249(suppl 1):1-6.
- Moscardino U, Scrimin S, Capello F and Altoè G (2010): Social support, sense of community, collectivistic values and depressive symptoms in adolescent survivors of the Beslan terrorist attack. *Soc Sci Med* 70:27-34.
- Moshman D (2011): Adolescent rationality and development: Cognition, morality, and identity. 3rd edition. Psychology Press, Taylor & Francis Group. New York.
- Moutier CY and Stein MB (1999): The history, epidemiology, and differential diagnosis of social anxiety disorder. *J Clin Psychiatry* 60(suppl 9):4-8.
- Mäki P, Koskela S, Murray GK, Nordsröm T, Miettunen J, Jääskeläinen E and Veijola JM (2014): Difficulty in making contact with others and social withdrawal as early signs of psychosis in adolescents – The Northern Finland Birth Cohort 1986. *Eur Psychiatr* 29:345-351.
- National Institute for Health and Welfare, (Terveyden ja Hyvinvoinnin Laitos (THL)) (2014): Tilastot, kouluterveyystutkimus. THL, Helsinki.
<http://www.thl.fi/fi/tutkimus-ja-asiantuntijatyo/vaestotutkimukset/kouluterveyskysely/tulokset/tulokset-aiheittain/mielenterveys>
- Nelson E, Grant, JD, Bucholz KK, Glowinski A, Madden PAF, Reich W and Heath AC (2000): Social phobia in a population-based female adolescent twin sample: comorbidity and associated suicide-related symptoms. *Psychol Med* 30:797-804.
- Newman BM, Newman PR, Griffen S, O'Connor K and Spas J (2007): The relationship of social support to depressive symptoms during the transition to high school. *Adolescence* 42:441-459.
- Newman DL, Moffitt TE, Caspi A, Magdol L, Silva PA and Stanton WR (1996): Psychiatric disorders in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *J Consult Clin Psychol* 64:552-562.

- Nietola M and Korkeila J (2013): Psykoottisen masennuksen diagnostiikka ja hoito SLL 68:2203 – 2207.
- Nolen-Hoeksema S and Girgus JS (1994): The emergence of gender differences in depression during adolescence. *Psychol Bull* 115:424-443.
- Nomura Y, Wickramaratne PJ, Warner V, Mufson L and Weissman MM (2002): Family discord, parental depression and psychopathology in offspring: Ten-year follow-up. *J Am Acad Child Adolesc Psychiatry* 41:402-409.
- Nuotio T-M, Karukivi M and Saarijärvi S (2013): Nuorten masennusta voidaan ehkäistä SLL 68:1089 – 1095.
- O'Farrell A, Flanagan E, Bedford D, James D and Howell F (2005): Factors associated with self-reported depression and self-esteem among school-going adolescents from a geographically defined region in Ireland. *Ir J Med Sci* 174:17-22.
- Orth U, Robins RW and Roberts BW (2008): Low self-esteem prospectively predicts depression in adolescence and young adulthood. *J Pers Soc Psychol*, 95:695-708.
- Padmanabhan A and Luna B (2014): Developmental imaging genetics: Linking dopamine function to adolescent behavior. *Brain Cogn* 89:27-38.
- Palosaari U, Aro H, and Laippala P (1996): Parental divorce and depression in young adulthood: adolescents' closeness to parents and self-esteem as mediating factor. *Acta Psychiatr Scand* 93:20-26.
- Paus T, Keshavan M and Giedd JN (2008): Why do many psychiatric disorders emerge during adolescence? *Nature* 9:947-957.
- Paxton SJ, Neumark-Sztainer D, Hannan PJ and Eisenberg ME (2006): Body dissatisfaction predicts depressive mood and low self-esteem in adolescent girls and boys. *J Clin Child Adolesc Psychol* 35:539-549.
- Pelkonen M, Marttunen M and Aro H (2003): Risk for depression: a 6-year follow-up of Finnish adolescents. *J. Affect Disord.* 77:41-45.

- Pelkonen M, Marttunen M, Kaprio J, Huurre T and Aro H (2008): Adolescent risk factors for episodic and persistent depression in adulthood. A 16-year prospective follow-up study of adolescents. *J Affect Dis* 106: 123-131.
- Perälä J, Suvisaari J, Saarni SI, Kuoppasalmi K, Isometsä E, Pirkola S, Partanen T, Tuulio-Henriksson A, Hintikka J, Kieseppä T, Härkönen T, Koskinen S and Lönnqvist J (2007): Lifetime prevalence of psychotic and bipolar I disorders in a general population. *Arch Gen Psychiatry* 64:19-28.
- Petersen AC (1998): Adolescent development. *Annu Rev Psychol* 39:583-607.
- Piko BF and Fitzpatrick KM (2003): Depressive symptomatology among Hungarian youth. A risk and protective factors approach. *Am J Orthopsych* 73(1):44-54.
- Piko BF, Kovacs E and Fitzpatrick KM (2009): What makes a difference? Understanding the role of protective factors in Hungarian adolescents' depressive symptomatology. *Eur Child Adolesc Psychiatry* 18:617-624.
- Pirkola S, Aalto-Setälä T, Suvisaari J, Lönnqvist J and mielen terveyden työryhmä (2005). Psykkinen oireilu ja mielen terveyden häiriöt. In: Nuorten aikuisten terveys. Terveys 2000 -tutkimuksen perustulokset 18-29 -vuotiaiden terveydestä ja siihen liittyvistä tekijöistä. Eds. Koskinen S, Kestilä L, Martelin T and Aromaa A. Kansanterveyslaitoksen julkaisuja, B7/ 2005, Helsinki.
- Raeuori A, Dick DM, Keski-Rahkonen A, Pulkkinen L, Rose RJ, Rissanen A, Kaprio J, Viken RJ and Silventoinen K (2007): Genetic and environmental factors affecting self-esteem from age 14 to 17: a longitudinal study of Finnish twins. *Psychol Med* 37:1625–1633.
- Raitasalo R (2007): Mielialakysely. Suomen oloihin Beckin lyhyen depressiokyselyn pohjalta kehitetty masennusoireilun ja itsetunnon kysely. Helsinki: Kela, Sosiaali- ja terveysturvan tutkimuksia 86, [Mood questionnaire. Finnish modification of the short form of the Beck Depression Inventory measuring depression symptoms and self-esteem. Abstract in English]. The Social Insurance Institution, Helsinki.
- Ranta K, Kaltiala-Heino R, Rantanen P, Tuomisto MT and Marttunen M (2007): Screening social phobia in adolescents from general population: The validity of

- the Social Phobia Inventory (SPIN) against a clinical interview. *Eur Psychiatry* 22:244-251.
- Ranta K, Kaltiala-Heino R, Rantanen P and Marttunen M (2009): Social phobia in Finnish general adolescent population: prevalence, comorbidity, individual and family correlates, and service use. *Depress Anxiety* 26:528-536.
- Rao U, Hammen CL and Poland R (2010): Longitudinal course of adolescent depression: 1 Neuroendocrine and psychosocial predictors. *J Am Acad Child Adolesc Psychiatry* 49:141-151.
- Rapee RM and Spence SH (2004): The etiology of social phobia: Empirical evidence and an initial model. *Clin Psychol Rev* 24:737-767.
- Riala K, Hakko H, Isohanni M, Pouta A and Räsänen P (2005). Is initiation of smoking associated with prodromal phase of schizophrenia. *Rev Psychiatr Neurosci* 30:26-32.
- Riala K, Viilo K, Hakko H, Räsänen P and STUDY-70 research group (2007). Heavy smoking among under 18-year-old psychiatric inpatients is associated with increased risk for suicide attempts. *Eur Psychiatr* 22:219-222.
- Ritakallio M, Luukkala T, Marttunen M, Pelkonen M and Kaltiala-Heino R (2010): Comorbidity between depression and antisocial behavior in middle adolescence: The role of perceived social support. *Nord J Psychiatry* 64:164-171.
- Roberts RE, Lewinsohn PM and Seeley JR (1995): Symptoms of DSM-III-R major depression in adolescence: evidence from an Epidemiological Survey. *J Am Acad Child Adolesc Psychiatry* 34:1608-1617.
- Rohde P, Lewinsohn PM and Seeley JR (1991): Comorbidity of unipolar depression: II comorbidity with other mental disorders in adolescents and adults. *J Ab Psychol* 100:214-222.
- Rose AJ and Rudolph KD (2006): A review of sex differences in peer relationship processes: Potential trade-offs for the emotional and behavioral development of girls and boys, *Psychol. Bul.* 132(1):98-131.

- Rosenberg M (1965): *Society and the adolescent self*. 1st edition. Princetown University Press. Princeton New Jersey.
- Rosenberg M, Schooler C, Schoenbach C and Rosenberg F (1995): Global self-esteem and specific self-esteem: Different concepts, different outcomes. *Am. Soc. Rev.* 60:141-156.
- Rueger SY, Malecki CK and Demaray MK (2010): Relationship between multiple sources of perceived social support and academic adjustment in early adolescence: comparisons across gender. *J Youth Adolescence* 39:47-61.
- Ruscio M, Brown TA, Chiu WT, Sareen J, Stein MB and Kessler RC (2008): Social fears and social phobia in the USA: results from the National Comorbidity Survey replication. *Psychol Med* 38:15-28.
- Rutter M, Tizard J, Yale W, Graham P and Whitmore K (1976): Research report: Isle of Wight studies 1964-1974. *Psychol Med* 6:313-332.
- Sadock BJ, Sadock VA and Ruiz P (eds.) (2009): Adolescent development. In Kaplan & Sadock's *Comprehensive textbook of Psychiatry*. 9th edition. Wolters Kluwer/Lippincott Williams & Wilkins. Philadelphia.
- Sartor CE and Youniss J (2002): The relationship between positive parental involvement and identity achievement during adolescence. *Adolescence* 37:221-234.
- Schmitz N, Kugler J and Rollnik J (2003): On the relation between neuroticism, self-esteem and depression: Results from the National Comorbidity Study. *Compr Psychiatry*, 44:169-176.
- Schneier FR, Johnson J, Hornig CD, Liebowitz MR and Weissman MM (1992): Social phobia. Comorbidity and morbidity in an epidemiologic sample. *Archives of General Psychiatry* 49:282-288.
- Schraedley PK, Gotlib IH and Hayward C (1999): Gender differences in correlates of depressive symptoms in adolescents. *J Adolesc Health* 25:98-108.

- Seeley JR, Stice E and Rohde P (2009): Screening for depression prevention: Identifying adolescent girls at a high risk for future depression. *J Abnorm Psychol* 118:161-170.
- Sheeber L, Hops H, Alpert A, Davis B and Andrews J (1997): Family support and conflict: Prospective relations to adolescent depression. *J Abnorm Child Psychol* 25:333-344.
- Shields M (2004): Social anxiety disorder - beyond shyness. *Suppl Health Rep* 15:45-61.
- Siegel JM, Yancey AK, Aneshensel CS and Schuler R (1999): Body image, perceived pubertal timing, and adolescent mental health. *J Adolesc Health* 25:155-165.
- Smith BH, Pelham WE, Gnagy E, Molina B and Evans S (2000): The reliability, validity, and unique contributions of self-report by adolescents receiving treatment for attention-deficit/hyperactivity disorder. *J. Consult. Clin. Psychol* 68:489-499.
- Stein MB and Kean YM (2000): Disability and quality of life in social phobia: Epidemiologic findings. *Am J Psychiatry* 157:1606-1613.
- Stein MB, Fuetsch M, Muller N, Hofler M, Lieb R and Wittchen HU (2001): Social anxiety disorder and the risk of depression: A prospective community study of adolescents and young adults. *Arch Gen Psychiatry* 58:251-256.
- Steinberg L and Morris AS (2001): Adolescent development. *Annu Rev Psychol* 52:83-110.
- Stevens MC (2009): The developmental cognitive neuroscience of functional connectivity. *Brain Cogn* 70:1-12.
- Stevens MC, Skudlarski P, Pearlson GD and Calhoun VD (2009): Age-related cognitive gains are mediated by the effects of white matter development on brain network integration. *Neuroimage* 48:738-746.
- Stice E, Ragan J and Randall P (2004): Prospective relations between social support and depression: Differential directions of effects for parent and peer support? *J Abnorm Psychol* 113:155-159.

- Sturman DA and Moghaddam B (2011): The neurobiology of adolescence: Changes in brain architecture, functional dynamics, and behavioral tendencies. *Neurosci Biobehav Rev* 35:1704-1712.
- Suvisaari J (2013): Mielenterveyshäiriöiden esiintyvyyden sukupuolierot *SLL* 68:1487 – 1492.
- Szatmari P (2009): More than counting: Milestones in child and adolescent psychiatric epidemiology. *J. Am Acad Child Adolesc Psychiatry* 48:353-355.
- Tabachnick BG and Fidell LS (2005): Using multivariate statistics, 5 th ed., Pearson AB. Boston Ma.
- Taylor MJ, Donner E J and Pang EW (2011): fMRI and MEG in the study of typical and atypical cognitive development. *Neurophysiol Clin* 42:19–25.
- Tuisku V, Pelkonen M, Kiviruusu O, Karlsson L, Ruuttu T and Marttunen M (2009): Factors associated with deliberate self-harm behaviour among depressed adolescent outpatients. *J Adolesc* 32:1125-1136.
- Uddin M, Koenen KC, de los Santos R, Bakshis E, Aiello AE and Galea S (2010): Gender differences in the genetic and environmental determinants of adolescent depression. *Depress Anxiety* 27:658-666.
- United Nations Children’s Fund (UNICEF) (2011): The State of world’s children. Adolescence, an age of opportunity. United Nations Children’s Fund. New York.
- Usmiani S and Daniluk J (1997): Mothers and their adolescent daughters: relationship between self-esteem, gender role identity and body image. *J Youth Adolesc* 26:45-62.
- Valery JH and Connor PO (1997): The nature and amount of support college-age adolescents request and receive from parents. *Adolesc* 32:323-337.
- van Erkel AR and Pattynama PM (1998): Receiver operating characteristic (ROC) analysis: Basic principles and applications in radiology. *Eur J Radiol* 27:88-94.

- Van Loon A, Tjihuis M, Picavet S, Surtees P and Ormel J (2003): Survey Non-response in the Netherlands: Effects on Prevalence Estimates and Associations. *Ann Epidemiol* 13:105-110.
- Van Voorhees BW, Paunescu D, Kuwabara SA, Basu A, Gollan J, Hankin BL, Melkonian S and Reinecke M (2008): Protective and vulnerability factors predicting new-onset depressive episode in a representative of U.S. adolescents. *J Adolescent Health* 42:605-61.
- Vaughan CA, Fosbee VA and Ennett ST (2010): Protective effects of maternal and peer support on depressive symptoms during adolescence. *J Abnorm Child Psychol* 38:261-272.
- Verhulst FC, Achenbach TM, van der Ende J, Erol N, Lambert MC, Leung PWL, Silva MA, Zilber N and Zubrick SR (2003): Comparison of problems reported by youths from seven countries. *Am J Psychiatry* 160:1479-1485.
- Verstraeten K, Vasey MW, Raes F and Bijttebier P (2009): Temperament and risk factors for depressive symptoms in adolescence: Mediation by rumination and moderation by effortful control. *J Abnorm Child Psychol* 37: 349-361.
- Vigil P, Orellana RF, Cortés ME, Molina CT, Switzer BE and Klaus H (2011): Endocrine modulation of the adolescent brain: A review. *J Pediatr Adolesc Gynecol* 24:330-337.
- Vollmann M, Scharloo M, Salewski C, Dienst A, Schonauer K and Renner B (2010): Illness representations of depression and perceptions of the helpfulness of social support: Comparing depressed and never-depressed persons. *J Affect Disord* 125:213-220.
- Wahlstrom D, Collins P, White T and Luciana M (2010): Developmental changes in dopamine neurotransmission in adolescence: Behavioral implications and issues in assessment. *Brain Cogn* 72:146-159.
- Warner CM, Fisher PH, Shrout PE, Rathor S and Klein RG (2007): Treating adolescents with social anxiety disorder in school: an attention control trial. *J Child Psychol Psychiatry* 48:676-686.

- Weiller E, Bisslerbe JC, Boyer P, Lepine JP and Lecrubier Y (1996): Social Phobia in General Health Care: An Unrecognised Undertreated Disabling Disorder. *Br J Psychiatry* 168:169-174.
- Wittchen HU and Fehm L (2001): Epidemiology, patterns of comorbidity, and associated disabilities of social phobia. *Psychiatr Clin North Am* 24:617-641.
- Wittchen HU and Fehm L (2003): Epidemiology and natural course of social fears and social phobia. *Acta Psychiatr Scand* 108(Suppl 417):4-18.
- Wittchen HU, Nelson CB and Lachner G (1998): Prevalence of mental disorders and psychosocial impairments in adolescents and young adults. *Psychol Med* 28:109-126.
- Wittchen HU, Stein MB and Kessler RC (1999): Social Fears and Social Phobia in a Community Sample of Adolescents and Young Adults: Prevalence, Risk Factors and Co-morbidity. *Psychol Med* 29:309-323.
- Wittchen HU, Kessler RC, Pfister H and Lieb M (2000): Why do people with anxiety disorders become depressed? A prospective-longitudinal community study [Anxiety and Depression: The Impact of Shared Characteristics on Diagnosis and Treatment]. *Acta Psych Scand*, 102(Suppl 406):14-23.
- World Health Organization (WHO): (1992): International Statistical Classification of Diseases and Related Health Problems (ICD-10) Vol 1, World Health Organization. Geneva.
- World Health Organization (WHO) (2014): Health for the world's adolescents. A second chance in the second decade. World Health Organization. Geneva.
- Yonkers KA, Dyck IR and Keller MB (2001): An eight-year longitudinal comparison of clinical course and characteristics of social phobia among men and women. *Psychiatr Serv* 52:637-643.
- Young JF, Miller MR and Khan N (2010): Screening and managing depression in adolescents. *Adolesc Health Med Ther* 1:87-95.

10 Appendix, Baseline Questionnaire items used in this study

NUORTEN MIELENTERVEYS TAMPEREEN YLIOPISTO

TERVEYSTIETEEN LAITOS

KANSANTERVEYSLAITOS

Hyvä 9-luokkalainen

Tampereen yliopiston terveystieteen laitos ja Kansanterveyslaitos tutkivat Tampereella ja Vantaalla nuorten elämäntapoja ja psyykkistä hyvinvointia Nuorten mielenterveyskyselyllä. Kysely on tarkoitettu kaikille näissä kaupungeissa peruskoulun 9-luokalla opiskeleville nuorille. Tutkimuksen tavoitteena on hankkia tietoa, jonka avulla voidaan tukea nuorten hyvinvointia ja mielenterveyttä kouluissa. Tampereen ja Vantaan kaupunkien tutkimuslupatoimikunnat ovat hyväksyneet tutkimuksen.

Tutkimukseen kuuluu tämä kysely sekä uudet samanlaiset kyselyt 2 ja 5 vuoden kuluttua. Osallistuminen on vapaaehtoista ja luottamuksellista. Saadut tiedot tulevat vain tutkijoiden käyttöön. Vastanneiden henkilöllisyys ei tule tutkijoiden tietoon. Ainoastaan tutkimuksen johtaja voi tarvittaessa selvittää vastaajien henkilöllisyyden. Saaduista vastauksista julkaistaan tutkimusraportteja, joista ei voi tunnistaa, ketkä vastasivat. Osallistuminen tai kieltäytyminen eivät vaikuta koulunkäyntiisi eikä terveyspalvelujen käyttöön. Halutessasi voit kieltäytyä jatkokyselyistä vaikka nyt vastaisitkin.

Jos päätät osallistua, vastaa oheiseen kyselylomakkeeseen ja sulje täytetty lomake palautuskuoreen.

Suljetut kuoret suljetaan luokassa palautuslaatikkoon, jonka tutkimusavustaja hakee pois koululta.

1. Sukupuoli

poika tyttö

2. Syntymäaika pp/kk/vvvv

Seuraavat kysymykset käsittelevät mielialan erilaisia piirteitä. Vastaa kuhunkin kysymykseen siten, millaiseksi tunnet itsesi TÄNÄÄN.

Valitse kustakin kysymyksestä vain yksi vaihtoehto. Joku kysymys voi tuntua sinusta yllättävältä. Toivomme kuitenkin, että vastaat kaikkiin kysymyksiin.

19. Minkälainen on mielialasi?

- mielialani on melko valoisa ja hyvä
- en ole alakuloinen tai surullinen
- tunnen itseni alakuloiseksi ja surulliseksi
- olen alakuloinen jatkuvasti enkä pääse siitä
- olen niin masentunut ja alavireinen, etten kestä enää

20. Miten suhtaudut tulevaisuuteen?

- suhtaudun tulevaisuuteeni toiveikkaasti
- en suhtaudu tulevaisuuteeni toivottomasti
- tulevaisuus tuntuu minusta melko masentavalta
- minusta tuntuu, ettei minulla ole tulevaisuudelta mitään odotettavaa
- tulevaisuus tuntuu minusta toivottomalta, enkä jaksa uskoa, että asiat muuttuisivat parempaan päin

21. Miten katsot elämäsi sujuneen?

- olen elämässäni onnistunut huomattavan usein
- en tunne epäonnistuneeni elämässä
- minusta tuntuu, että olen epäonnistunut pyrkimyksissäni tavallista useammin
- elämäni on tähän saakka ollut vain sarja epäonnistumisia
- tunnen epäonnistuneeni täydellisesti ihmisenä

22. Miten tyytyväiseksi tai tyytymättömäksi tunnet itsesi?

- olen varsin tyytyväinen elämääni
- en ole erityisen tyytymätön
- en nauti asioista samalla tavalla kuin ennen
- minusta tuntuu, etten saa enää tyydytystä juuri mistään
- olen täysin tyytymätön kaikkeen

23. Minkälaisena pidät itseäsi?

- tunnen itseni melko hyväksi
- en tunne itseäni huonoksi ja arvottomaksi
- tunnen itseni huonoksi ja arvottomaksi melko usein
- nykyään tunnen itseni arvottomaksi melkein aina
- olen kerta kaikkiaan arvoton ja huono

24. Onko sinulla pettymyksen tunteita?

- olen tyytyväinen itseni ja suorituksiini
- en ole pettynyt itseni suhteen
- olen pettynyt itseni suhteen
- minua inhottaa oma itseni
- vihaan itseäni

25. Onko sinulla itsesi vahingoittamiseen liittyviä ajatuksia?

- minulla ei ole koskaan ollut itsemurha-ajatuksia
- en ajattele enkä halua vahingoittaa itseäni
- minusta tuntuu, että olisi parempi jos olisin kuollut
- minulla on tarkat suunnitelmat itsemurhasta
- tekisin itsemurhan jos siihen olisi mahdollisuus

26. Miten suhtaudut vieraitten ihmisten tapaamiseen?

- pidän ihmisten tapaamisesta ja juttelemisesta
- en ole menettänyt kiinnostustani muihin ihmisiin
- toiset ihmiset eivät enää kiinnosta minua niin paljon kuin ennen

- olen melkein kokonaan menettänyt mielenkiintoni sekä tunteeni toisia ihmisiä kohtaan
- olen menettänyt mielenkiintoni muihin ihmisiin enkä välitä heistä lainkaan

27. Miten koet päätösten tekemisen?

- erilaisten päätösten tekeminen on minulle helppoa
- pystyn tekemään päätöksiä samoin kuin ennenkin
- varmuuteni on vähentynyt ja yritän lykätä päätösten tekoa
- minulla on suuria vaikeuksia päätösten teossa
- en pysty enää lainkaan tekemään ratkaisuja ja päätöksiä

28. Minkälaisena pidät olemustasi ja ulkonäköäsi?

- olen melko tyytyväinen ulkonäkööni ja olemukseeni
- ulkonäkössäni ei ole minua haittaavia piirteitä
- olen huolissani siitä, että näytän epämiellyttävältä
- minusta tuntuu, että näytän rumalta
- olen varma, että näytän rumalta ja vastenmieliseltä

29. Minkälaista nukkumisesi on?

- minulla ei ole nukkumisessa minkäänlaisia vaikeuksia
- nukun yhtä hyvin kuin ennenkin
- herätessäni aamuisin olen paljon väsyneempi kuin ennen
- minua haittaa unettomuus
- kärsin unettomuudesta, nukahtamisvaikeuksista tai liian aikaisin kesken unien heräämisestä

30. Tunnetko väsymystä ja uupumusta?

- väsyminen on minulle lähes täysin vierasta
- en väsy helpommin kuin tavallisestikaan
- väsyn nopeammin kuin ennen
- vähäinenkin työ väsyttää ja uuvuttaa minua
- olen liian väsynyt tehdäkseni mitään

31. Minkälainen ruokahalusi on?

- ruokahalussani ei ole mitään hankaluuksia
- ruokahaluni on ennallaan
- ruokahaluni on huonompi kuin ennen
- ruokahaluni on paljon huonompi kuin ennen
- minulla ei ole enää lainkaan ruokahalua

32. Oletko ahdistunut tai jännittynyt?

- pidän itseäni melko hyvähermoisena enkä ahdistu kovinkaan helposti
- en tunne itseäni ahdistuneeksi tai "huonohermoiseksi"
- ahdistun ja jännityn melko helposti
- tulen erityisen helposti tuskaiseksi, ahdistuneeksi tai jännittyneeksi
- tunnen itseni jatkuvasti ahdistuneeksi ja tuskaiseksi kuin hermoni olisivat "loppuun kuluneet"

Kuinka paljon seuraavat ongelmat ovat vaivanneet sinua VIIMEKSI KULUNEEN VIIKON aikana? Merkitse rasti ainoastaan yhteen ruutuun kunkin ongelman kohdalla ja vastaa kaikkiin kysymyksiin

33. Pelkään määräävässä asemassa olevia ihmisiä.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

34. Toisten ihmisten edessä punastuminen vaivaa minua.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

35. Minua pelottavat kutsut ja tapahtumat, joissa on ihmisiä.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

36. Vältän puhumasta ihmisille, joita en tunne.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

37. Nolestumisen pelko saa minut välttämään joidenkin asioiden suorittamista tai puhumista toisille ihmisille.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

38. Arvostelluksi tuleminen pelottaa minua paljon.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

39. Hikoileminen toisten ihmisten edessä aiheuttaa minulle ahdinkoa.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

40. Vältän kutsuille osallistumista.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

41. Vältän tekemisiä, joissa olen huomion keskipisteenä.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

42. Tuntemattomille puhuminen pelottaa minua.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

43. Vältän joutumasta pitämään puheita.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

44. Tekisin mitä tahansa välttääkseni arvostelluksi tulemisen.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

45. Sydämen tykytys vaivaa minua ollessani ihmisten lähellä.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

46. Pelkään tehdä asioita kun ihmiset saattaisivat katsella

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

47. Nolostuneeksi tuleminen tai tyhmältä vaikuttaminen kuuluvat pahimpiin pelkoihini.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

48. Vältän puhumasta kenellekään määräävässä asemassa olevalle.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

49. Vapiseminen tai täriseminen muiden edessä aiheuttaa minulle ahdinkoa.

- ei yhtään
- vähän
- kohtalaisesti
- hyvin paljon
- äärimmäisen paljon

63. Seuraavassa on lueteltu lapsilla ja nuorilla esiintyviä ominaisuuksia ja ongelmia. Arvioi miten mikin väittämä sopii sinuun, kun ajattelet TÄTÄ HETKEÄ JA VIIMEKSI KULUNUTTA PUOLTA VUOTTA.

Tunnen syyllisyyttä, kun olen tehnyt jotain, mitä ei olisi pitänyt tehdä

- En koskaan
- Joskus
- Usein

Liikun sellaisten kavereiden kanssa, jotka joutuvat usein vaikeuksiin

- En koskaan
- Joskus
- Usein

Valehtelen tai petkutan

- En koskaan
- Joskus
- Usein

Olen mieluiten itseäni vanhempien lasten tai nuorten kanssa

- En koskaan
- Joskus
- Usein

Karkailen kotoa

- En koskaan
- Joskus
- Usein

Sytyttelen tulipaloja

- En koskaan
- Joskus
- Usein

Varastan kotoa

- En koskaan
- Joskus
- Usein

Varastan kodin ulkopuolelta

- En koskaan
- Joskus
- Usein

Kiroilen tai käytän rivoa kieltä

- En koskaan
- Joskus
- Usein

Pinnaan joiltakin tunneilta tai koulusta

- En koskaan
- Joskus
- Usein

Käytän alkoholia tai muita huumaavia aineita

- En koskaan
- Joskus
- Usein

Väitän usein vastaan

- En koskaan
- Joskus
- Usein

Kerskailen, leuhkin, mahtailen

- En koskaan
- Joskus
- Usein

Olen ilkeä, kiusaan muita

- En koskaan
- Joskus
- Usein

Yritän saada paljon huomiota

- En koskaan
- Joskus
- Usein

Rikon omia tavaroitani

- En koskaan
- Joskus
- Usein

Rikon muiden tavaroita

- En koskaan
- Joskus
- Usein

Olen tottelematon koulussa

- En koskaan
- Joskus
- Usein

Olen kateellinen muille

- En koskaan
- Joskus
- Usein

Käyn herkästi toisten kimppuun (esim. tönäisen, lyön)

- En koskaan
- Joskus
- Usein

Huudan paljon

- En koskaan
- Joskus
- Usein

Pelleilen ja yritän tehdä vaikutuksen

- En koskaan
- Joskus
- Usein

Olen itsepäinen

- En koskaan
- Joskus
- Usein

Mielialani tai tunteeni vaihtelevat äkillisesti

- En koskaan
- Joskus
- Usein

Puhun liian paljon

- En koskaan
- Joskus
- Usein

Kiusaan aika paljon muita

- En koskaan
- Joskus
- Usein

Olen kiivasluontoinen

- En koskaan
- Joskus
- Usein

Uhkailen satuttavani muita ihmisiä

- En koskaan
- Joskus
- Usein

Olen äänekkäämpi kuin muut lapset tai nuoret

- En koskaan
- Joskus
- Usein

96. Kuuluuko perheeseesi?

- äiti ja isä
- äiti ja isäpuoli
- isä ja äitipuoli
- vain äiti
- vain isä
- joku muu huoltaja, kuka _____

98. Mikä on korkein koulutus, minkä isäsi on suorittanut?

- kansakoulu/kansalaiskoulu tai peruskoulu
- peruskoulu ja ammatillinen koulutus
- lukio tai lukio ja ammatillinen koulutus
- yliopisto- tai korkeakoulututkinto

99. Mikä on korkein koulutus, minkä äitisi on suorittanut?

- kansakoulu/kansalaiskoulu tai peruskoulu
- peruskoulu ja ammatillinen koulutus
- lukio tai lukio ja ammatillinen koulutus
- yliopisto- tai korkeakoulututkinto

SOSIAALINEN TUKEA

106. Miten hyvin seuraavat väittämät pitävät paikkansa sinun kohdallasi? Rastita joka riviltä YKSI parhaiten sinuun sopiva vaihtoehto.

Minulla on tärkeä ihminen, joka tukee minua, kun tarvitsen apua

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Minulla on tärkeä ihminen, jonka kanssa voin jakaa elämän ilot ja surut Saan todellista tukea perheeltäni

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Perheeni tukee minua aina, kun tarvitsen apua

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Minulla on tärkeä ihminen joka lohduttaa minua

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Ystäväni todella tukevat minua, kun tarvitsen apua

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Luotan ystäväni apuun, kun asiat alkavat mennä heikosti

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Voin keskustella ongelmistani perheeni kanssa

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Minulla on ystäviä, joiden kanssa voin jakaa elämäni ilot ja surut

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Minulla on tärkeä ihminen, joka osaa ottaa huomioon tunteeni

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Tehdessäni tärkeitä ratkaisuja saan perheeltäni apua

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

Voin keskustella ongelmistani ystäväieni kanssa

- Eri mieltä
- Melko eri mieltä
- Ei samaa mieltä mieltä eikä eri meiltä
- Melko samaa mieltä
- Samaa mieltä

107. Vastaa seuraaviin väittämiin valitsemalla sinua parhaiten kuvaava vaihtoehto. Rastita joka riviltä YKSI parhaiten sinuun sopiva vaihtoehto.

Mielestäni olen ihmisenä ainakin yhtä arvokas kuin muut

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Mielestäni minulla on useita hyviä ominaisuuksia

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Olen taipuvainen pitämään itseäni epäonnistujana

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Kykenen tekemään asioita yhtä hyvin kuin useimmat muutkin ihmiset

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Mielestäni minulla ei ole paljoakaan ylpeilemisen aihetta

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Asennoidun itseeni myönteisesti

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Suurin piirtein olen tyytyväinen itseeni

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Toivoisin, että minulla olisi enemmän itsekunnioitusta

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Tunnen itseni joskus todella hyödyttömäksi

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

Joskus ajattelen, etten kelpaa mihinkään

- Täysin eri mieltä
- Eri mieltä
- Samaa mieltä
- Täysin samaa mieltä

11 Original publications



Research report

Relationship between social phobia and depression differs between boys and girls in mid-adolescence

Juha-Matti Väänänen^{a,*}, Sari Fröjd^b, Klaus Ranta^{a,b}, Mauri Marttunen^{c,d,e}, Mika Helminen^{b,f}, Riittakerttu Kaltiala-Heino^{a,g}^a Department of Adolescent Psychiatry, Tampere University Hospital, Finland^b Tampere School of Public Health, University of Tampere, Finland^c National Public Health Institute, Department of Mental Health and Alcohol Research, Helsinki, Finland^d Peijas Hospital, Department of Adolescent Psychiatry, Helsinki University Hospital, Vantaa, Finland^e Department of Adolescent Psychiatry, University of Kuopio and Kuopio University Hospital, Finland^f Science Center, Pirkanmaa Hospital District, Finland^g University of Tampere, Medical School, Finland

ARTICLE INFO

Article history:

Received 23 November 2010

Received in revised form 25 February 2011

Accepted 22 March 2011

Available online 16 April 2011

Keywords:

Adolescence
Social phobia
Anxiety
Depression
Comorbidity
Gender
Risk

ABSTRACT

Background: Earlier studies suggest that social phobia (SP) and depression (DEP) often have their onset in adolescence, and are highly comorbid, with SP mainly preceding depression. There is a lack of population-based prospective studies among adolescents vulnerable to both disorders, taking into account possible gender differences in the relationship between the two. **Methods:** This study is part of a prospective Adolescent Mental Health Cohort (AMHC) study. Subjects are 9th grade pupils (mean age 15.5 years (sd 0.39)) responding to a survey conducted 2002–2003 (T1) and a 2-year follow-up 2004–2005 (T2) (N=2038). Social phobia was measured by the Social Phobia Inventory (SPIN) and depression by the 13-item Beck Depression Inventory (BDI-13).

Results: Risk for depression at T2 by SP at T1 was elevated only among boys (OR 3.6, 95% C.I. 1.507–8.579, $p=0.004$), whereas among girls, risk for SP at T2 by DEP at T1 was elevated (OR 7.8, 95% CI 4.529–13.391, $p<0.001$). The course of both disorders was unstable and recovery was common.

Limitations: Lack of diagnostic interviews and fairly high drop-out rate (36.9%) in follow-up. **Conclusions:** The relationship between SP and depression in adolescence seems different for boys and girls. Further studies are needed to explore factors explaining the different course of these disorders among boys and girls. Clinicians need to be alert to comorbidity when examining an adolescent with SP or depression.

© 2011 Elsevier B.V. All rights reserved.

1. Introduction

Social phobia (SP) is a disabling disorder, characterized by a fear of negative evaluation by others. Lifetime prevalence of social phobia among adults varies between 7% and 13.3% (Kessler et al., 2005; Magee et al., 1996; Pélissolo et al., 2000;

Pollack, 2001; Ruscio et al., 2008; Stein and Kean., 2000). In adolescents the point prevalence of SP has been estimated at 1.6% to 6%, and lifetime prevalence at 7% to 14%. (Essau et al., 1999; Gren-Landell et al., 2009; Ranta et al., 2009; Shields, 2004; Wittchen et al., 1999). Prevalence is higher among girls than boys in adolescence (Dell'osso et al., 2002; Gren-Landell et al., 2009; Shields, 2004; Wittchen et al., 1999). In a recent Finnish study, however, the female to male ratio was 0.7 to 1 in 12–14 year-olds and rose to 1.5 to 1 in 15–17 year-olds (Ranta et al., 2009). SP typically has its onset in adolescence,

* Corresponding author at: Tampere University Hospital, Box 2000, 33521 Tampere, Finland. Tel.: +358 50 570 6240; fax: +358 3 31163797.

E-mail address: juha.vaananen@pshp.fi (J.-M. Väänänen).

and often runs a chronic course; remission rarely occurs without treatment. The diagnostic stability of SP has been reported to be substantial (Merikangas et al., 2002), yet there appears to be fluctuation in symptoms and there may be some symptom-free periods during the course of illness (Chartier et al., 1998; Wittchen and Fehm, 2001).

The point prevalence of major depression in adolescence based on diagnostic interviews has ranged between 1 and 6% (Kessler et al., 2001; Lewinsohn et al., 1998; Roberts et al., 1995). The prevalence of self-reported depression (DEP) in community based surveys has varied between 15 and 25%.

In the US National Comorbidity Survey the 1-month prevalence of major depression in 15–16 year-olds was 7% and that of minor depression 2.6%, in 17–18 year-olds, the respective prevalences being 6.5% and 3.9%. The lifetime prevalence of both major and minor depression among 15–18 year-olds was 25% (Kessler and Walters, 1998).

Both community and clinical studies have reported high rates of comorbidity for SP. Of adult patients with SP, 50–80% have at least one other psychiatric disorder, most commonly other anxiety disorders, depression or substance use disorders (Magee et al., 1996; Stein et al., 1990; Stein et al., 1999; Weiller et al., 1996). In adult and mixed adolescent-adult populations 17–35% of patients with SP have had a depressive disorder, the odds ratio being 1.5–4.4 (Chartier et al., 2003; Kessler et al., 1999; Lampe et al., 2003; Rihmer et al., 2001; Schneier et al., 1992; Wittchen et al., 1999).

Only a few general population studies on adolescents with SP have been carried out. The German Early Developmental Stages of Psychopathology Study (EDSP) reported that two thirds of adolescents with SP had a comorbid disorder, and the odds ratio of having a depressive episode was 3.5 (Bittner et al., 2004; Stein et al., 2001; Wittchen et al., 1999). The prevalence of comorbid major depression was lower among 14–17 year-olds than among 18–24 year-olds. By four to five-year follow-up most adolescents with anxiety disorders had developed comorbid depression (Wittchen et al., 2000). Furthermore, at ten-year follow-up SP was found to be related to a substantial risk, OR 3.18, for subsequent depression. (Beesdo et al., 2007). In the Bremen adolescent study, a population study on 12–17 year-old adolescents, it was found that 29.4% of adolescents with SP had a depressive disorder (Essau et al., 1999). In other population based studies on adolescents the odds ratio of comorbid depression in subjects with SP has been approximately 3 (Lewinsohn et al., 1997; Nelson et al., 2000). In a recent Finnish community study, 41% of 12–17 year-old adolescents with social phobia had comorbid depression (Ranta et al., 2009). In a Finnish clinical study on adolescent depression anxiety disorders were the most common comorbid disorders found in 57% of depressed patients (Karlsson et al., 2006), social phobia was found in 17% of depressed patients (Karlsson, personal information).

Social phobia is reported to precede depression in 72–100% of comorbid cases in most adult or mixed adolescent-adult population and clinical studies (Kessler et al., 1999; Magee et al., 1996; Merikangas et al., 1996; Shields, 2004; Weiller et al., 1996), and in a pediatric clinical sample (Chavira et al., 2004). The onset of SP has also been reported before depression in many studies on adolescents (Nelson et al., 2000; Wittchen et al., 2000), but not in all (Lewinsohn et al., 1997). In a population-based prospective study on

adults, the incidence rate ratio for social phobia in one year was 3.6 in subjects with major depression (Acarturc et al., 2009).

There are several hypotheses on the relationship between SP and depression. Firstly, SP may cause psychological and functional deterioration leading to depression (Kessler et al., 1999; Merikangas et al., 1996). Secondly, there may be common risk factors behind the two disorders with different or changing phenotype (Angold et al., 1999a, 1999b). Thirdly, anxiety and depression could be different expressions of the same disorder across the course of this condition (e.g. anxiety is prominent in the early phases, and depression prominent in later stages); (Angold et al., 1999a, 1999b; Merikangas et al., 1996).

Most studies so far on the relationship between SP and depression have used adult or mixed adolescent and adult populations; used retrospective assessment; and have lacked information about differences between sexes. For a better understanding of the development of comorbidity between social phobia and depression prospective population based studies among adolescents are needed.

The first aim of the present study was to report on the prevalence of social phobia, depression and the comorbidity between these two disorders at ages 15 and 17, especially differences between sexes, and changes over the follow-up period. Secondly, we aimed to examine the course of the two disorders and the development of comorbidity between these disorders during a two-year follow-up, also emphasizing differences between sexes.

2. Materials and methods

2.1. Study samples and procedures

This study is part of an ongoing prospective cohort study, the Adolescent Mental Health Cohort (AMHC) study, conducted in two Finnish cities, Tampere (200,000 inhabitants) and Vantaa (180,000 inhabitants). Data collection, procedures and measures of the study have been reported in detail elsewhere (Frojd et al., 2006, 2007). Briefly, at T1 data were collected by a school survey completed by the ninth graders in all Finnish-speaking secondary schools in the two cities. A person-identifiable survey was completed during a school lesson under the supervision of a teacher. For students absent from school on the original survey day, another opportunity to participate was offered in the school within a couple of weeks. For students not present on either occasion the questionnaires were sent by post twice, and if no reply was received, it was concluded that the student was not willing to participate. Eligible participants at T2 data were students who had participated at T1. Multiple approaches were used to contact the adolescents at follow-up. School-based surveys like that at T1 were organized in upper secondary schools and vocational schools. Adolescents not reached through schools were contacted by postal survey. Finally the same survey was offered by internet to those who had not yet responded via their schools or by post.

The subjects of the present study were students responding to a survey conducted during 2002–2003 (T1) and at 2-year follow-up during 2004–2005 (T2). The baseline sample consisted of 1609 girls and 1669 boys. The mean age was

15.5 years (sd 0.39). Of the respondents, 71% were living in two-parent families. The distribution of the subjects' parents' highest education was (father/mother): 16%/13% primary school only, 40%/30% primary school and vocational school, 17%/31% high school with or without vocational school, and 28%/26% academic degree. (Frojd et al., 2006).

A total of 2070 adolescents completed the survey at both T1 and T2. The response rate of the final sample was 63.1% (2070/3278). Of the respondents, 56.6% were girls. The mean age at T2 was 17.6 years (sd 0.4). At T2 over 80% of the adolescents were full-time students (girls 89.6%, boys 82.0%, $p < 0.001$). Response rate at T1 was 94.4% and at T2 63.1%. In our different analyses are included all relevant responses, but because part of the responses were insufficiently made, there is some differences in N's in different analyses.

2.2. Measures

A Finnish modification of the 13-item Beck Depression Inventory (RBDI, Raitasalo, 2007) was used to assess depression (Beck et al., 1974; Beck and Beck, 1972). The brief BDI is a widely used self-report scale measuring the severity of depressive symptoms, and its reliability and validity are good (Bennett et al., 1997). The RBDI is an appropriate method for measuring depression in Finnish adolescents in population studies (Kaltiala-Heino et al., 1999; Raitasalo, 2007). Each item is scored 0–3 according to the severity of the symptom. Sum scores of 13 items (range 0–39) were dichotomised to non/mild depression (scores 0–7), and moderate/severe depression (scores 8–39) (Beck and Beck, 1972). The cutpoint of 8 predicts a diagnosis of depression by structured interview (SCAN) with good sensitivity (0.93) and specificity (0.88) (Fountoulakis et al., 2003).

The Social Phobia Inventory (SPIN), (Connor et al., 2000), a 17-item self-report questionnaire for measuring a wide range of symptoms of SP on a five-point Likert-type scale, was used as a measure of SP. The scale has previously shown good reliability and construct validity (Johnson et al., 2006; Ranta et al., 2007a, 2007b) for use among English-speaking and Finnish adolescents. For the Finnish translation of the SPIN, a cut-off score of 24 points has resulted in 81.8% sensitivity and 85.1% specificity in relation to a clinician-administered diagnosis of SP (Ranta et al., 2007b), and was used to identify participants with SP.

2.3. Covariates

The covariates controlled for in statistical analyses were age, family structure (living with both biological parents/living in some other family structure), both parents' highest educational qualification (comprehensive school only, education higher than comprehensive school) and externalizing symptoms measured by Youth Self Report (YSR) (Achenbach, 1991) at T1.

3. Data analysis

According to social phobia (SP) and depression (DEP), four groups were formed at T1 and T2: subjects with 1) neither SP nor DEP, 2) SP without DEP, 3) DEP without SP, 4) comorbid SP and DEP. Subjects not answering all the questions on

social phobia or depression ($N = 32$) were excluded from the analyses.

Prevalences were calculated as simple frequencies for social phobia without depression, depression without social phobia, and comorbid social phobia and depression at T1 and T2. Percentual distributions between non-comorbid disorders and comorbid disorders were also calculated at both time points. Calculations were made separately for males and females. Significance of sex-differences in prevalences as well as changes in prevalences over time was tested using Pearson's chi-square and Fisher's exact tests.

ORs for risk of developing depression at T2 were analyzed using binary logistic regression comparing the SP without depression group to the group free from both disorders and for risk of developing social phobia at T2 comparing the depression without SP group to the group free from both disorders, significance was tested with 95% confidence intervals. The effect of age, family structure, both parents' educational status and externalizing symptoms at T1 on ORs was controlled for using binary logistic regression.

Data analyses were made using SPSS, version 16.0 (SPSS Inc., Chicago, Illinois, USA).

3.1. Drop-out

Non-responders at T2 were more likely to be boys (63.4% vs. girls 36.6%; $p < 0.001$) and more likely to have depression (11.7% vs. 9.1%, $p = 0.020$) at baseline than those responding to both surveys. Both parents' educational status was lower among dropouts compared with participants ($P = 0.001$ for fathers and $P = 0.002$ for mothers). Not living with both biological parents was also more common among the dropouts (30.3% vs. 27.5% $p < 0.01$).

4. Results

Current prevalences of social phobia (SP) without depression (DEP), DEP without SP and comorbid disorders are shown in Table 1.

There was a significant increase in the prevalence of SP without DEP among girls (from 4.9% to 7.1%, $P < 0.05$) between ages 15 and 17, but not among boys (Table 1). There was a significant decrease in the prevalence of DEP without SP in the total cohort (from 5.3% to 3.9%, $p < 0.05$). The prevalence of comorbid SP and DEP increased significantly only among boys (from 2.1% to 3.8%, $P = 0.05$). The proportion of those without either disorder did not change from 15 years to 17 years.

At age 15 of those who had SP, 42.9% also presented with DEP, girls more frequently than boys (51.7% vs. 27.9%, $p = 0.002$). Of those with DEP at age 15, 42.5% had comorbid SP, with no significant difference between girls and boys (girls 45.1% vs. boys 35.8%, $p > 0.05$). At age 17 of those with SP, 42.5% had comorbid DEP, girls and boys equally commonly (43.1% vs. 41.5%, $p > 0.05$). Of those with DEP at age 17, 54.9% also presented with SP, girls and boys equally often (52.1 vs. 60.7%, $p > 0.05$).

There was great instability over time among both genders in the two disorders studied. Among boys, a majority of those with DEP, SP or both at T1 had recovered at T2. Among girls, DEP at T1 had a less favorable outcome than among boys;

Table 1

Prevalence of social phobia and depression among Finnish adolescents at ages 15 and 17 (% (n/N)).

	At age 15				At age 17			
	All	Boys	Girls	p	All	Boys	Girls	p
No SP, no DEP	85.7 (1747/2038)	88.5 (782/884)	83.6 (965/1154)	0.002	85.0 (1733/2038)	88.2 (780/884)	82.6 (953/1154)	<0.001
SP without DEP	5.2 (105/2038)	5.5 (49/884)	4.9 (56/1154)	n.s.	6.4 (130/2038)	5.4 (48/884)	7.1 (82/1154)	n.s.
DEP without SP	5.3 (107/2038)	3.8 (34/884)	6.3 (73/1154)	0.016	3.9 (79/2038)	2.5 (22/884)	4.9 (57/1154)	0.005
Comorbid SP and DEP	3.9 (79/2038)	2.1 (19/884)	5.2 (60/1154)	<0.001	4.7 (96/2038)	3.8 (34/884)	5.4 (62/1154)	n.s.

SP = social phobia, DEP = depression.

there was a significant difference in boys more frequently recovering from DEP without SP, 73.5% of boys versus 41.1% of girls recovered ($p = 0.002$) (Table 2). Heterotypic course of SP without DEP to DEP without SP was very rare: all girls and all but one boy of those with SP at T1, who developed subsequent DEP, had a comorbid disorder. Conversely heterotypic course was more common. However, both girls and boys who were depressed at T1 and developed subsequent SP at T2 were also mostly comorbid.

Risk for DEP at T2 according to SP without DEP at T1 was significantly elevated among boys (OR 3.6, $p = 0.004$, 95% CI 1.5–8.6). Among girls, SP without DEP at T1 did not predict subsequent DEP (OR 2.1, $p > 0.05$, 95% CI 0.9–5.2). Among boys 4.4% of those without SP and DEP and 14.2% of those with SP without DEP at 15 had either DEP with or without SP at 17 and among girls 5.4% and 10.7% respectively. These findings persisted after controlling covariates age, family structure, both parents highest educational status and externalizing symptoms at T1, (OR 4.1, $p = 0.002$, 95% CI 1.692–10.092 for boys and OR 2.265, $p > 0.05$, 95% CI 0.917–5.595 for girls) see Table 3. Risk for SP at T2 according to DEP without SP at T1 was elevated among girls (OR 7.8, $p < 0.001$, 95% CI 4.5–13.3), but among boys, DEP without SP at T1 did not predict subsequent SP (OR 2.5, $p > 0.05$, 95% CI 0.9–6.7). Among boys 6.6% of those without DEP or SP and 14.7% of those with DEP without SP had SP with or without DEP at 17, and among girls respectively 6.7% and 35.7%. After controlling covariates age, family structure, both parents' highest educational status and externalizing symptoms at T1 among boys OR enhanced to 2.9, being just outside statistical significance at 95% confidence level ($p = 0.050$, 95% CI 0.999–8.262). This change occurred after adding externalizing symptoms to regression model. Among girls OR remained

significant after controlling covariates (OR 9.6, $p < 0.001$, 95% CI 5.179–17.718) see Table 4.

5. Discussion

The main finding in our population based prospective cohort study among Finnish 15-year-old adolescents was that the risk for subsequent depression reported in earlier studies may be present among boys only. Among girls, social phobia at age 15 did not significantly predict depression at age 17, but an increased risk of subsequent social phobia at age 17 according to depression at age 15 was found. Among boys social phobia at 15 did not significantly predict depression at 17, but after controlling covariates, especially externalizing symptoms, association between earlier social phobia with subsequent depression was in the borderline of statistical significance. To the authors' best knowledge, no studies on the risk for subsequent social phobia among adolescents with depression have been published nor on this kind of gender difference. With a prospective population-based study design, it was possible to get a reliable picture of the development of these disorders in adolescence and to test the causality hypotheses based on findings from mostly retrospective studies among adults.

The research so far has mainly suggested that social phobia precedes depression (Chavira et al., 2004; Kessler et al., 1999; Weiller et al., 1996). Major depression was found to be a risk factor for social phobia in one study (Acarturc et al., 2009). Gender differences have in most other studies not been addressed. In the National Comorbidity Survey reporting retrospective findings on a mixed adolescent–adult population, no gender differences were found in ORs between social phobia and lifetime mood disorders (Kessler et al.,

Table 2

Stability over time of social phobia and depression among Finnish adolescents from age 15 to 17 among boys and girls (%) (n/N).

		17 years				
		No SP no DEP	SP without DEP	DEP without SP	Comorbid SP and DEP	Total
15 years	Boys					
	No SP no DEP	91.7 (717/782)	4.0 (31/782)	1.8 (14/782)	2.6 (20/782)	100%
	SP without DEP	55.1 (27/49)	30.6 (15/49)	2.0 (1/49)	12.2 (6/49)	100%
	DEP without SP	73.5 (25/34)	2.9 (1/34)	11.8 (4/34)	11.8 (4/34)	100%
	Comorbid SP and DEP	57.9 (11/19)	5.3 (1/19)	15.8 (3/19)	21.1 (4/19)	100%
	Girls					
	No SP no DEP	90.3 (871/965)	4.4 (42/965)	3.1 (42/965)	2.3 (22/965)	100%
	SP without DEP	58.9 (33/56)	30.4 (17/56)	0 (0/56)	10.7 (6/56)	100%
	DEP without SP	41.1 (30/73)	11.0 (8/73)	23.3 (17/73)	24.7 (18/73)	100%
	Comorbid SP and DEP	31.7 (19/60)	25.0 (15/60)	16.7 (10/60)	26.7 (16/60)	100%

DEP = Depression, SP = Social phobia.

Table 3
Logistic regression results predicting depression at 17 years.

	B	S.E.	Wald	Sig.	Exp (B)	95% C.I. for EXP(B)	
						Lower	Upper
<i>Boys N = 824</i>							
SP at age 15	1.419	0.456	9.697	0.002	4.132	1.692	10.092
Age	−0.325	0.520	0.392	0.531	0.722	0.261	2.000
FS	0.131	0.380	0.119	0.730	1.140	0.542	2.398
FHE	−0.876	0.480	3.326	0.068	0.416	0.162	1.068
MHE	1.122	0.640	3.073	0.080	3.072	0.876	10.773
ES	0.042	0.020	4.311	0.038	1.043	1.002	1.084
<i>Girls N = 1017</i>							
SP at age 15	0.818	0.461	3.139	0.076	2.265	0.917	5.595
Age	−0.280	0.433	0.420	0.517	0.756	0.324	1.764
FS	−0.470	0.287	2.676	0.102	0.625	0.356	1.098
FHE	−0.391	0.354	1.223	0.269	0.676	0.338	1.353
MHE	−0.334	0.408	0.669	0.413	0.716	0.322	1.594
ES	0.044	0.020	5.039	0.025	1.045	1.006	1.086

SP at 15 = Social phobia without depression at age 15. No (referent) N (boys/girls) = 775/961, yes N = 49/56.

FS = Family structure at T1, living with both biological parents N = 615/749, living in some other family context (referent) N = 209/268.

FHE = Father's highest educational qualification at T1, comprehensive school only (referent), N = 118/152, education higher than comprehensive school N = 706/865.

MHE = Mother's highest educational qualification at T1, comprehensive school only (referent), N = 113/109, education higher than comprehensive school N = 711/908.

ES = externalizing symptoms, sum of Youth Self Report (YSR)(Achenbach, 1991) N = 824/1017.

1999). In contrast to our finding, in the prospective EDSP study female sex was associated with greater risk for subsequent depression among adolescents with social phobia (Beesdo et al., 2007). Our different findings may be explained by our prospective study design and narrower age cohort, which allows a naturalistic observation of development of these two disorders. In retrospective studies, recall bias may influence differently the recalling of depression and of social phobia. In a one-year age-cohort developmental differences between sexes may be better observed than in wider age-cohorts.

Our findings suggest that the relationship between social phobia and depression differs greatly between girls and boys. The first possible explanation may be that the two disorders simply have different courses in boys and girls. Secondly, the disorders may influence boys and girls in a different way. For example, social phobia may have a different impact on males than females and this may lead to greater risk for depression among males, and depression may have a different impact, for example, on self-esteem among girls than boys, leading to greater risk for social phobia among girls. Thirdly, these two disorders may in fact be different phenotypes of the same

Table 4
Logistic regression results predicting social phobia at 17 years.

	B	S.E.	Wald	Sig.	Exp (B)	95% C.I. for EXP(B)	
						Lower	Upper
<i>Boys N = 809</i>							
DEP at age 15	1.056	0.539	3.837	0.050	2.874	0.999	8.262
Age	−0.667	0.463	2.077	0.150	0.513	0.207	1.271
FS	0.066	0.334	0.039	0.843	1.068	0.555	2.055
FHE	−0.473	0.414	1.301	0.254	0.623	0.277	1.404
MHE	0.628	0.538	1.366	0.243	1.874	0.653	5.377
ES	−0.032	0.021	2.333	0.127	0.968	0.929	1.009
<i>Girls N = 1034</i>							
DEP at age 15	2.260	0.314	51.863	<0.001	9.579	5.179	17.718
Age	0.049	0.327	0.023	0.881	1.050	0.553	1.993
FS	−0.018	0.254	0.005	0.945	0.983	0.597	1.618
FHE	0.042	0.332	0.016	0.898	1.043	0.545	1.999
MHE	−0.545	0.344	2.500	0.114	0.580	0.295	1.139
ES	−0.026	0.018	2.076	0.150	0.947	0.940	1.010

DEP at 15 = Depression without depression at age 15. No (referent) N (boys/girls) = 775/961, yes N = 34/73.

FS = Family structure at T1, living with both biological parents N = 602/748, living in some other family context (referent) 207/286.

FHE = Father's highest educational qualification at T1, comprehensive school only (referent), N = 117/155, education higher than comprehensive school, N = 692/879.

MHE = Mother's highest educational qualification at T1, comprehensive school only (referent) N = 105/113, education higher than comprehensive school, N = 704/921.

ES = externalizing symptoms, sum of Youth Self Report (YSR)(Achenbach, 1991) N = 809/1034.

illness, the clinical picture of which differs in different developmental stages in adolescence, and the gender difference is explained by the fact that girls develop earlier than boys. The course of depression in adolescence does indeed differ according to sex. Preadolescent prevalence is nearly equal among girls and boys increasing sharply in adolescence, especially among girls (Kessler et al., 2001). Conley and Rudolph (2009) further suggested that among girls, depression is associated with early, and among boys with late pubertal maturation, although other studies on pubertal timing have not suggested such a gender difference (Kaltiala-Heino et al., 2003). It seems also that the clinical picture, especially presence or absence of externalizing symptoms, modifies the relationship between earlier social phobia and subsequent depression.

It is also possible that adolescents with depression without SP at age 15 had had social phobia or comorbid disorder earlier. This is supported by the fact that the average age of onset of social phobia is before 15 years (Chartier et al., 1998; Wittchen et al., 1999), and that social phobia is not a stable state; patients do not constantly fulfill the criteria for social phobia in follow-ups (Wittchen and Fehm, 2003). At T1 comorbid disorder with both SP and DEP was found more frequently among girls (51.7%) than among boys (27.9%). Girls may have had earlier social phobia and already developed comorbid disorder by age 15. We have to limit our conclusions that in our findings among girls who have either SP without DEP or DEP without SP at 15 these findings about the course of these two disorders are relevant, because in our follow-up heterotypic course from SP without DEP to DEP without SP was very rare.

The current prevalence of depression in the present study was in accordance with earlier studies, but that of social phobia was somewhat higher. The two disorders were highly comorbid, both among boys and girls both at age 15 and 17, as in earlier studies (Essau et al., 1999; Ranta et al., 2009; Wittchen et al., 2000). As in an earlier Finnish study (Ranta et al., 2009) there was no gender difference in the prevalence of SP. There was some change in prevalences between ages, and switching from one group to another in two-year follow-up occurred between all groups except from SP without depression to depression without SP. This finding is in accordance with earlier findings reporting the instability of these disorders (Kessler and Walters, 1998; Wittchen and Fehm, 2003).

Of the theories about the relationship between social phobia and depression these findings do not support the causal hypothesis of depression developing as a consequence of social phobia. Our findings challenge the hypotheses that social phobia causes psychosocial deterioration, which leads to depression and also to a neurobiological causal relationship between these two disorders. Our findings lend support to the hypothesis that there are common factors behind the development of both disorders. Some support is also given to the hypothesis that they are actually merely different phenotypes of one phenomenon, and the phenotype differs between individuals and changes over time. However, a rare heterotypic course from social phobia without depression to depression without social phobia also speaks against this hypothesis.

5.1. Methodological considerations

The present study was based on a large population sample. The coverage of compulsory comprehensive school until age

16 in Finland is more than 99%. The cohort may thus be considered representative of the age group studied.

The response rate in the Adolescent Mental Health Cohort baseline survey was good. However, there was a considerable drop-out at T2, and, more importantly, dropping out from T2 data collection was related to depression in T1. Thus, the dropout may result in the prevalence rates presented being underestimates. However, there is no particular reason to assume that this would influence the associations between the phenomena studied. (Van Loon et al., 2003) Also twice as many boys than girls dropped out, and this may have an impact on our main results. However this do not explain the finding about the course of these two disorders among girls and it is also unlikely to explain the course of these disorders among boys either.

The age range in the study samples was narrow: hence the data are homogenous regarding age. The main interest was in middle adolescents, since this is the main developmental phase with significant changes in social relationships, and is associated with the onset of major mental disorders and problems most prevalent in adulthood. For example, in depression research the usefulness of samples with both children and adolescents in studies of risk factors has been criticized, considering the increase in prevalence of during transition from childhood to adolescence (Costello et al., 2003; Ford et al., 1999; Newman et al., 1996).

A further limitation of this study is the lack of information about any other potentially confounding disorders. Nor do we have any information about possible interventions in disorders before T1 or between T1 and T2. These factors may have some effect on results, and should be controlled for in future studies.

The lack of diagnostic interviews is a limitation in this study. However, the measures of the present study have previously been used in large community samples of adolescents in Finland and also elsewhere. The Finnish modification of the short 13-item BDI has been widely used to study depression in unselected European populations and in screening depression in clinical work in Finland (Raitasalo, 2007). The Finnish version of SPIN has presented good reliability and validity in adolescent population (Ranta et al., 2007b). In epidemiological research the use of self-reported symptom lists is arguable, especially in children and adolescents. Symptoms causing functional impairment may hinder normal development even with the presence of no DSM or ICD disorder (Angold et al., 1999b; Lewinsohn et al., 2000). Adolescents can report reliably about their health in certain psychological disorders (Smith et al., 2000). Self-reported depression is also persistent in adolescence (Charman, 1994) and predicts major depressive disorder (Lewinsohn et al., 1998).

6. Conclusions

The relationship between social phobia and depression in middle adolescence is complex and differs by sex. Among girls depression is a greater risk factor for subsequent social phobia than vice versa. Among boys the previously assumed course from social phobia to depression seems valid. To fully understand the relationship between the phenomena, possible common factors behind these two disorders need to be explored. Because co-morbidity between adolescent social

phobia and depression is common and co-morbid disorders are more demanding to treat, clinicians should remember to evaluate depression in adolescents presenting with social phobia, and co-morbid social phobia in adolescent depression. In further studies influence of clinical symptom profile, especially externalizing symptoms, should be emphasized.

Role of funding source

Funding for this study was provided by the Yrjö Jahnsson Foundation, the Finnish Cultural Foundation, and Pirkanmaa Hospital District (Tampere University Hospital) Competitive Research Funding. The Yrjö Jahnsson Foundation, the Finnish Cultural Foundation, and Pirkanmaa Hospital District Competitive Research Funding had no further role in study design, in the collection, analysis and interpretation of data, in the writing of the report or in the decision to submit the paper for publication.

Conflict of interest

Author Juha-Matti Väänänen has within three years given lecture twice getting payment from pharmaceutical Company Astra-Zeneca, and author Klaus Ranta has given lecture sporadically getting payment from pharmaceutical companies Bristol-Mayer-Squipp and Lundbaeck. All other authors declare that they have no conflicts of interest.

Acknowledgements

Yrjö Jahnsson Foundation, the Finnish Cultural Foundation, and Pirkanmaa Hospital District (Tampere University Hospital) Competitive Research Funding, for financial support to this study.

References

- Acarturc, C., Smit, F., de Graaf, R., van Straten, A., ten Have, M., Cuijpers, P., 2009. Incidence of social phobia and identification of its risk indicators: a model for prevention. *Acta Psychiatr. Scand.* 119, 62–70.
- Achenbach, T.M. 1991. *Manual for the Child Behavior Checklist/4–18 and 1991 profile.* Burlington, VT: University of Vermont Department of Psychiatry.
- Angold, A., Costello, E.J., Erkanli, A., 1999a. Comorbidity. *J. Child. Psychol. Psychiatry* 40 (1), 57–87.
- Angold, A., Costello, E.J., Farmer, E., Burns, B., Erkanli, A., 1999b. Impaired but undiagnosed. *J. Am. Acad. Child Adolesc. Psychiatry* 38, 129–137.
- Beck, A., Beck, R., 1972. Screening depressed patients in family practice. A rapid technic. *Postgrad. Med. J.* 52, 81–85.
- Beck, A., Rial, W., Rickels, K., 1974. Short form of depression inventory: cross-validation. *Psychol. Rep.* 34, 1184–1186.
- Beesdo, K., Bittner, A., Pine, D.S., Stein, M.B., Hofler, M., Lieb, R., Wittchen, H.U., 2007. Incidence of social anxiety disorder and the consistent risk for secondary depression in the first three decades of life. *Arch. Gen. Psychiatry* 64, 903–912.
- Bennett, D.S., Ambrosini, P.J., Bianchi, M., Barnett, D., Metz, C., Rabinowich, H., 1997. Relationship of Beck depression inventory factors to depression among adolescents. *J. Affect. Disord.* 45, 127–134.
- Bittner, A., Goodwin, R.D., Wittchen, H.U., Beesdo, K., Höfler, M., Lieb, R., 2004. What characteristics of primary anxiety disorders predict subsequent major depressive disorder? *J. Clin. Psychiatry* 65, 618–626.
- Charman, T., 1994. The stability of depressed mood in young adolescents: a school-based survey. *J. Affect. Disord.* 30, 109–116.
- Chartier, M.J., Hazen, A.L., Stein, M.B., 1998. Lifetime patterns of social phobia: a retrospective study of the course of social phobia in a nonclinical population. *Depress. Anxiety* 7, 113–121.
- Chartier, M.J., Walker, J.R., Stein, M.B., 2003. Considering comorbidity in social phobia. *Soc. Psychiatry Psychiatr. Epidemiol.* 38, 728–734.
- Chavira, D.A., Stein, M.B., Bailey, K., Stein, M.T., 2004. Comorbidity of generalized social anxiety disorder and depression in a pediatric primary care sample. *J. Affect. Disord.* 80 (2–3), 163–171.
- Conley, C.S., Rudolph, K.D., 2009. The emerging sex difference in adolescent depression: interacting contribution of puberty and peer stress. *Dev. Psychopathol.* 21, 593–620.
- Connor, K.M., Davidson, J.R.T., Churchill, L.E., Sherwood, A., Foa, E., Weisler, R.H., 2000. Psychometric properties of the Social Phobia Inventory (SPIN): a new self rating scale. *Br. J. Psychiatry* 176, 379–386.
- Costello, E.J., Mustillo, S., Erkanli, A., Keeler, G., Angold, A., 2003. Prevalence and development of psychiatric disorders in childhood and adolescence. *Arch. Gen. Psychiatry* 60, 837–844.
- Dell'osso, L., Sattioni, M., Pappasogli, A., Rucci, P., Ciapparelli, A., Di Poggio, A.B., Ducci, F., Hardoy, C., Cassano, G.B., 2002. Social anxiety spectrum: gender differences in Italian high school students. *J. Nerv. Ment. Dis.* 190 (4), 225–232.
- Essau, C.A., Conradt, J., Petermann, F., 1999. Frequency and comorbidity of social phobia and social fears in adolescents. *Behav. Res. Ther.* 37 (9), 831–843.
- Ford, T., Goodman, R., Meltzer, H., 1999. The British child and adolescent mental health survey: the prevalence of DSM-IV disorders. *J. Am. Acad. Child Adolesc. Psychiatry* 42 (10), 1203–1211.
- Fountoulakis, K.N., Iacovides, A., Kleanthous, S., Samolis, S., Gougoulis, K., St Kaprinis, G., Bech, P., 2003. The Greek translation of the symptoms rating scale for depression and anxiety: preliminary results of the validation study. *BMC Psychiatry* 3 (21), 1–8.
- Frojd, S., Marttunen, M., Pelkonen, M., von der Pahlen, B., Kaltiala-Heino, R., 2006. Perceived financial difficulties and maladjustment outcomes in adolescence. *Eur. J. Public Health* 16, 542–548.
- Frojd, S., Marttunen, M., Pelkonen, M., von der Pahlen, B., Kaltiala-Heino, R., 2007. Adult and peer involvement in help-seeking for depression in adolescent population. A two-year follow-up in Finland. *Soc. Psychiatry Psychiatr. Epidemiol.* 42, 945–952.
- Gren-Landell, M., Tillfors, M., Furmark, T., Bohlin, G., Andersson, G., Svedin, C.G., 2009. Social phobia in Swedish adolescents, prevalence and gender differences. *Soc. Psychiatry Psychiatr. Epidemiol.* 44, 1–7.
- Johnson, H.S., Inderbitzen-Nolan, H., Anderson, E.R., 2006. The Social Phobia Inventory: validity and reliability in an adolescent community sample. *Psychol. Assess.* 18, 269–277.
- Kaltiala-Heino, R., Rimpelä, M., Rantanen, P., Laippala, P., 1999. Finnish Modification of the 13-item Beck Depression Inventory in screening an adolescent population for depressiveness and positive mood. *Nord. J. Psychiatry* 53, 451–457.
- Kaltiala-Heino, R., Marttunen, M., Rantanen, P., Rimpelä, M., 2003. Early puberty is associated with mental health problems in middle adolescence. *Soc. Sci. Med.* 57, 1055–1064.
- Karlsson, L., Pelkonen, M., Ruuttu, T., Kiviruusu, O., Heilä, H., Holli, M., Kettunen, K., Tuisku, V., Tuulio-Henriksson, A., Törrönen, J., Marttunen, M., 2006. Current comorbidity among consecutive adolescent psychiatric outpatients with DSM-IV mood disorders. *Eur. Child Adolesc. Psychiatry* 15, 220–231.
- Kessler, R.C., Walters, E.E., 1998. Epidemiology of DSM-III-R Major depression and minor depression among adolescents and young adults in the National Comorbidity Survey. *Depress. Anxiety* 7, 3–14.
- Kessler, R.C., Stang, P., Wittchen, H.U., Stein, M., Walters, E.E., 1999. Lifetime co-morbidities between social phobia and mood disorders in the US National Comorbidity Survey. *Psychol. Med.* 29 (3), 555–567.
- Kessler, R.C., Avenevoli, S., Merikangas, K.R., 2001. Mood disorders in children and adolescents: an epidemiologic perspective. *Biol. Psychiatry* 49, 1002–1014.
- Kessler, R.C., Chiu, W.T., Demler, O., Walters, E.E., 2005. Prevalence, severity, and comorbidity of 12-Month DSM-IV disorders in the National Comorbidity Survey Replication. *Arch. Gen. Psychiatry* 62, 617–627.
- Lampe, L., Slade, T., Issakidis, C., Andrews, G., 2003. Social phobia in the Australian National Survey of Mental Health and Well-Being. *Psychol. Med.* 33 (4), 637–646.
- Lewinsohn, P.M., Zinbarg, R., Seeley, J.R., Lewinsohn, M., Sack, W.H., 1997. Lifetime comorbidity among anxiety disorders and other mental disorders in adolescents. *J. Anxiety Disord.* 11 (4), 377–394.
- Lewinsohn, P.M., Rohde, P., Seeley, J.R., 1998. Major depressive disorder in older adolescents: prevalence, risk factors, and clinical implications. *Clin. Psychol. Rev.* 18 (7), 765–794.
- Lewinsohn, P., Solomon, A., Seeley, J.R., Zeiss, A., 2000. Clinical implications of 'subthreshold' depressive symptoms. *J. Abnorm. Psychol.* 109, 345–351.
- Magee, W.J., Eaton, W.W., Wittchen, H.U., McGonagle, K.A., Kessler, R.C., 1996. Agoraphobia, simple phobia, and social phobia in the National Comorbidity Survey. *Arch. Gen. Psychiatry* 53 (2), 159–168.
- Merikangas, K.R., Whitaker, A., Angst, J., Eaton, W., Canino, G., Rubio-Stipec, M., Wacker, H., Wittchen, H.U., Andrade, L., Essau, C., Kraemer, H., Robins, L., Kupfer, D., 1996. Comorbidity and boundaries of affective disorders with anxiety disorders and substance misuse: results of an International Task Force [Comorbidity of Mood Disorders]. *Br. J. Psychiatry* 168, 58–67.
- Merikangas, K.R., Avenevoli, S., Acharya, S., Zhang, H., Angst, J., 2002. The spectrum of social phobia in the Zurich cohort study of young adults. *Biol. Psychiatry* 51 (1), 81–91.
- Nelson, E., Grant, J.D., Bucholz, K.K., Glowinski, A., Menden, P.A.F., Reich, W., Heath, A.C., 2000. Social phobia in a population-based female adolescent twin sample: co-morbidity and associated suicide-related symptoms. *Psychol. Med.* 30 (4), 797–804.

- Newman, D.L., Moffitt, T.E., Caspi, A., Magdol, L., Silva, P.A., Stanton, W.R., 1996. Psychiatric disorders in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *J. Consult. Clin. Psychol.* 64, 552–562.
- Pélissolo, A., André, C., Moutard-Martin, F., Wittchen, H.U., Lépine, J.P., 2000. Social phobia in the community: relationship between diagnostic threshold and prevalence. *Eur. Psychiatry* 15, 25–28.
- Pollack, M.H., 2001. Comorbidity, Neurobiology, and pharmacotherapy of social anxiety disorder. *J. Clin. Psychiatry* 62 (suppl. 12), 24–29.
- Raitasalo, R., 2007. Mielialakysely. Suomen oloihin Beckin lyhyen depressio-kyselyn pohjalta kehitetty masennusoireilun ja itsetunnon kysely. Helsinki: Kela, Sosiaali- ja terveysturvan tutkimuksia 86. [Mood questionnaire. Finnish modification of the short form of the Beck Depression Inventory measuring depression symptoms and self-esteem. Abstract in English] The Social Insurance Institution, Helsinki, Helsinki.
- Ranta, K., Kaltiala-Heino, R., Koivisto, A.M., Tuomisto, M.T., Pelkonen, M., Marttunen, M., 2007a. Age and gender differences in social anxiety symptoms during adolescence: the Social Phobia Inventory (SPIN) as a measure. *Psychiatry Res.* 153, 261–270.
- Ranta, K., Kaltiala-Heino, R., Rantanen, P., Tuomisto, M.T., Marttunen, M., 2007b. Screening social phobia in adolescents from general population: the validity of the Social Phobia Inventory (SPIN) against a clinical interview. *Eur. Psychiatry* 22, 244–251.
- Ranta, K., Kaltiala-Heino, R., Rantanen, P., Marttunen, M., 2009. Social phobia in Finnish general adolescent population: prevalence, comorbidity, individual and family correlates, and service use. *Depress. Anxiety* 26, 528–536.
- Rihmer, Z., Szádóczy, E., Füredi, J., Kiss, K., Papp, Z., 2001. Anxiety disorders comorbidity in bipolar I, bipolar II and unipolar major depression: results from a population-based study in Hungary. *J. Affect. Disord.* 67 (1–3), 175–179.
- Roberts, R.E., Lewinsohn, P.M., Seeley, J.R., 1995. Symptoms of DSM-III-R major depression in adolescence: evidence from an Epidemiological Survey. *J. Am. Acad. Child Adolesc. Psychiatry* 34 (12), 1608–1617.
- Ruscio, A.M., Brown, T.A., Chiu, W.T., Sareen, J., Stein, M.B., Kessler, R.C., 2008. Social fears and social phobia in the USA: results from the National Comorbidity Survey Replication. *Psychiatr. Med.* 38, 15–28.
- Schneier, F.R., Johnson, J., Hornig, C.D., Liebowitz, M.R., Weissman, M.M., 1992. Social phobia. Comorbidity and morbidity in an epidemiologic sample. *Arch. Gen. Psychiatry* 49 (4), 282–288.
- Shields, M., 2004. Social anxiety disorder-beyond shyness. *Health Rep.* 15 (Suppl), 45–61.
- Smith, B.H., Pelham, W.E., Gnagy, E., Molina, B., Evans, S., 2000. The reliability, validity, and unique contributions of self-report by adolescents receiving treatment for attention-deficit/hyperactivity disorder. *J. Consult. Clin. Psychol.* 68, 489–499.
- Stein, M.B., Tancer, M.E., Gelernter, C.S., Vittone, B.J., Uhde, T.W., 1990. Major depression in patients with social phobia. *Am. J. Psychiatry* 147 (5), 637–639.
- Stein, M.B., McQuaid, J.R., Laffaye, C., McCahill, M.E., 1999. Social phobia in the primary care medical setting. *J. Fam. Pract.* 48 (7), 514–519.
- Stein, M.B., Kean, Y.M., 2000. Disability and quality of life in social phobia: epidemiologic findings. *Am. J. Psychiatry* 157 (10), 1606–1613.
- Stein, M.B., Fuetsch, M., Muller, N., Hofer, M., Lieb, R., Wittchen, H.U., 2001. Social anxiety disorder and the risk of depression: a prospective community study of adolescents and young adults. *Arch. Gen. Psychiatry* 58 (3), 251–256.
- Van Loon, A., Tijhuis, M., Picavet, S., Surtees, P., Ormel, J., 2003. Survey Non-response in the Netherlands: effects on prevalence estimates and associations. *Ann. Epidemiol.* 13 (2), 105–110.
- Weiller, E., Bisslerbe, J.C., Boyer, P., Lepine, J.P., Lecrubier, Y., 1996. Social phobia in general health care: an unrecognized undertreated disabling disorder. *Br. J. Psychiatry* 168 (2), 169–174.
- Wittchen, H.U., Stein, M.B., Kessler, R.C., 1999. Social fears and social phobia in a community sample of adolescents and young adults: prevalence, risk factors and co-morbidity. *Psychol. Med.* 29 (2), 309–323.
- Wittchen, H.U., Kessler, R.C., Pfister, H., Lieb, M., 2000. Why do people with anxiety disorders become depressed? A prospective-longitudinal community study [Anxiety and Depression: The Impact of Shared Characteristics on Diagnosis and Treatment]. *Acta Psychiatr. Scand. Suppl.* 102, 14–23.
- Wittchen, H.U., Fehm, L., 2001. Epidemiology, patterns of comorbidity, and associated disabilities of social phobia. *Psychiatr. Clin. North Am.* 24, 617–641.
- Wittchen, H.U., Fehm, L., 2003. Epidemiology and natural course of social fears and social phobia. *Acta Psychiatr. Scand. (Suppl. (417))*, 4–18.

How Low Is Low? Low Self-Esteem as an Indicator of Internalizing Psychopathology in Adolescence

Health Education & Behavior
40(4) 392–399
© 2012 Society for Public
Health Education
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/1090198112445481
heb.sagepub.com


Rasmus Isomaa, PhD¹, Juha-Matti Väänänen, MD², Sari Fröjd, DrHealthSci³,
Riittakerttu Kaltiala-Heino, MD, DrMedSci, BSc^{2,3},
and Mauri Marttunen, MD, DrMedSci^{4,5}

Abstract

Schools are among the most important setting for preventive interventions among adolescents. There are evidence-based intervention programs for adolescents at risk for and with early signs of mental health problems but one demanding task is to detect the ones who are in need of an intervention. The aim of the present study was to analyze associations between self-esteem, depressive symptoms, and social anxiety in order to determine clinically relevant cut-points for male and female adolescents' self-esteem as measured with the Rosenberg Self-Esteem Scale (RSES). The participants of the present prospective study, started in 2002–2003, were 2070 adolescents aged 15 years (1,167 girls and 903 boys) at two study sites in Finland who participated at both baseline and 2-year follow-up. Self-esteem was related to depressive symptoms and social anxiety, and the RSES was able to discriminate between cases of depression and social phobia. The present study suggests a cutoff of 25 points to classify low self-esteem in both girls and boys. Low self-esteem may function as an indicator of various forms of internalizing psychopathology. The RSES is worth further examination as a potential screening tool for adolescents in risk of psychopathology.

Keywords

adolescents, health promotion, measurement development, mental health, school-based health

Adolescence is a unique and distinct developmental period, which comprises both psychological and physiological processes of change. During adolescence significant changes occur in brain development, endocrinology, emotions, cognition, behavior, and interpersonal relationships (Evans & Seligman, 2005). A large part of the developmental process involves adapting, with increased cognitive capacity and social understanding, to a changing body (Erikson, 1980). A large part of mental health disorders have their onset in adolescence and many carry over into adulthood. Apart from disorders, many health habits, which influence adult behavior, have their foundation in adolescence (Evans & Seligman, 2005).

Adolescent development involves major life decisions, physical and psychological changes, as well as status ambiguity resulting in a heightened concern with the self-image. A favorable outcome of this developmental process is, among many other important outcomes, high self-esteem. Self-esteem can be defined as a positive or negative attitude toward the self and constitutes a major part of the self-image. Self-esteem is involved in our thoughts, feelings, and behaviors. High self-esteem is reflected in regarding oneself as good enough. It encompasses feelings of self-worth and self-respect but not necessarily feelings of superiority over others.

The opposite, low self-esteem can be thought of as a disagreeable self-picture and involves being dissatisfied with and rejecting the observed self (Rosenberg, 1989).

How we think about and value ourselves does matter. Our self-esteem functions in a system of mutual interactions between self-esteem, behavior, and social environment. Changes in one part of the system lead to changes in the other parts as well (Swann, Chang-Schneider, & McClarty, 2007). High self-esteem has benefits in the form of enhanced initiative and pleasant feelings (Baumeister, Campbell, Krueger, & Vohs, 2003). In adolescence, enhanced initiative may lead to a broader array of opportunities, which in turn may lead to an

¹Åbo Akademi University, Vasa, Finland

²Tampere University Hospital, Tampere, Finland

³University of Tampere, Tampere, Finland

⁴University of Helsinki and Helsinki University Central Hospital, Helsinki, Finland

⁵National Institute for Health and Welfare, Helsinki, Finland

Corresponding Author:

Rasmus Isomaa, Department of Social Sciences, Åbo Akademi University,
P.O. Box 311, Vasa, FI-65101, Finland.
Email: rasmus.isomaa@abo.fi

enhanced quality of life. In a systemic view, as proposed by Swann et al. (2007), the question of causality between self-esteem and mental health becomes less central. Of more importance is how the different parts of the system develop and how that influences overall development (Cicchetti & Rogosch, 2002).

Social anxiety and depressive symptoms are common among adolescents (Angold & Costello, 1993; Kessler et al., 2005; Lewinsohn, Zinbarg, Seeley, Lewinsohn, & Sack, 1997; Newman et al., 1996) and low self-esteem is associated with both kinds of symptomatology (Pullman & Allik, 2000; Rosenberg, 1989; Schmitt & Allik, 2005). A systematic review of psychiatric disorders in Europe reported a 12-month median prevalence for depression of 5.7% and for social phobia of 2.0% in adolescents and adults (Wittchen et al., 2011). Comparable figures of 5.3% for depression and of 3.2% for social phobia among Finnish adolescents have been reported (Haarasilta, Marttunen, Kaprio, & Aro, 2001; Ranta, Kaltiala-Heino, Rantanen, & Marttunen, 2009). Reliance on self-report measures generally results in higher prevalence figures than presented above (Kessler, Avenevoli, & Merikangas, 2001). Depressive symptoms include depressed or irritable mood, anhedonia, diminished interest in social activities, sense of worthlessness, and sleep and appetite changes (American Psychiatric Association, 2000; Commission on Adolescent Depression and Bipolar Disorder, 2005). Social anxiety is expressed in extreme worry over humiliation or embarrassment in social situations, without marked impairment in the ability to interact with others (American Psychiatric Association, 2000; Commission on Adolescent Anxiety Disorders, 2005). Although the body of literature on the associations between low self-esteem and depressive symptoms is abundant (MacPhee & Andrews, 2006; Marcotte, Fortin, Potvin, & Papillon, 2002; Muris, Schmidt, Lambrichs, & Meesters, 2001; Robertson & Simons, 1989; Schmitz, Kugler, & Rollnik, 2003), empirical studies focusing on the relationship between low self-esteem and social anxiety in adolescents are scarce. However, the role of negative self-judgment is emphasized in theoretical models of social anxiety (Alden & Mellings, 2004; Hofmann, 2007).

Schools are among the most important settings for preventive interventions among adolescents. There are evidence-based intervention programs for adolescents at risk for and with early signs of mental health problems (World Health Organization [WHO], 2004), but one demanding task is to detect the ones who are in need of an intervention. Because of a huge number of psychiatric diagnoses (Rutter, 2011) with complex manifestations, screening for low self-esteem instead of different emotional and behavioral problems might be a more effective approach worth further examination. The utility of a screening test can be assessed using the concepts of sensitivity, specificity, positive predictive value, and negative predictive value. These concepts all revolve around the relation between true and false negatives and positives (Loong, 2003). A perfect test will produce only true positives and negatives, but this ideal is rarely attainable, so

determining the optimal cutoff of a test involves both clinical and financial considerations (van Erkel & Pattynama, 1998).

The most widely used measure of global self-esteem is the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1989). Despite criticism over measuring self-esteem by explicitly asking questions regarding self-evaluation (Buhrmester, Blanton, & Swann, 2011), the 10-item self-report measure, presented already in 1965 (Rosenberg, 1965), has maintained popularity over the years (Schmitt & Allik, 2005). To the best of the authors' knowledge, no widely accepted cut-points for low self-esteem exist (The Morris Rosenberg Foundation, 2011).

The aim of the present study was to analyze associations between self-esteem, depressive symptoms, and social anxiety in order to assess and determine clinically relevant cut-points for male and female adolescents' self-esteem as measured with the RSES (Rosenberg, 1989).

Method

Participants and Procedure

The Adolescent Mental Health Cohort study is a prospective follow-up study on prevalence and determinants of mental health problems and risk behavior among Finnish adolescents at two study sites, Tampere (population 200,000) and Vantaa (population 180,000). The Adolescent Mental Health Cohort study started in 2002-2003 targeting all Finnish-speaking students in the ninth grade of comprehensive school in the two cities. Subjects of the baseline (T1) sample ($N = 3,278$; 1,609 girls and 1,669 boys; mean age 15.5 ± 0.4 years) were approached for participation in a 2-year follow-up (T2). The baseline sample constituted 86.1% of all eligible students in the catchment area. The subjects of the present study were the 2,070 adolescents (1,167 girls and 903 boys; mean age 17.6 ± 0.4 years at follow-up) who completed the survey at both time points. The participants of the present study comprised 63.1% of the baseline sample. The data collection procedure and measures of the study have been reported in detail elsewhere (Fröjd, Kaltiala-Heino, & Marttunen, 2011; Fröjd, Marttunen, Pelkonen, von der Pahlen, & Kaltiala-Heino, 2006, 2007).

Measures

Self-esteem. Self-esteem was measured with the RSES (Rosenberg, 1989). The RSES is the most widely used measure of global self-esteem (Schmitt & Allik, 2005). The RSES was originally designed as a Guttman scale (Guttman, 1950), but is at present most often used as a Likert-type scale (Likert, 1932; Wallace, 1988). It was originally developed using a large sample of high school students and has shown high test-retest correlations (.82-.88) and internal consistency (.77-.88). The scale produces a single factor of global

self-esteem with a principally invariant factor structure and functional equivalence across cultures (The Morris Rosenberg Foundation, 2011; Rosenberg, 1989; Schmitt & Allik, 2005). The scale consists of 10 items scored from 1 to 4 resulting in a maximum summed score of 40. No widely accepted cut-points for low self-esteem exist. Cronbach's alpha value for RSES in the present study was .88 at T1 and .89 at T2.

Depressive symptoms. The Finnish modification of the 13-item Beck Depression Inventory–Short Version (RBDI; Beck & Beck, 1972; Raitasalo, 2007) was used as a measure of depressive symptoms. The BDI has been widely used among adolescent samples (Bennett et al., 1997). Each item is scored from 0 to 3 resulting in a maximum summed score of 39. A cutoff score of 8 points was adopted to identify adolescents with moderate to severe depression (Beck, Rial, & Rickels, 1974). The psychometrics of the RBDI has been demonstrated among Finnish adolescents (Kaltiala-Heino, Rimpelä, Rantanen, & Laippala, 1999). Cronbach's alpha value for RBDI in the present study was .84 at T1 and .86 at T2.

Social anxiety. The Social Phobia Inventory (SPIN; Connor et al., 2000), a 17-item questionnaire for measuring a wide range of symptoms of social phobia, was used as a measure of social anxiety. The SPIN measures fear in social situations, avoidance of performance or social situations, and physiological discomfort in social situations. Subjects are asked to rate the frequency of each symptom during the past week on a 5-point Likert-type scale. The SPIN has shown good reliability (Ranta, Kaltiala-Heino, Koivisto, et al., 2007) and construct validity (Johnson, Inderbitzen-Nolan, & Anderson, 2006) for use among adolescents. For the Finnish translation of the SPIN, a cutoff score of 24 points has resulted in good sensitivity and specificity in relation to a diagnosis of social phobia assessed using the K-SADS-PL (Ranta, Kaltiala-Heino, Rantanen, Tuomisto, & Marttunen, 2007). The range of sum score is 0 to 68. Cronbach's alpha value for SPIN in the present study was .90 at T1 and .92 at T2.

Attrition. Girls were more likely than boys to participate at both time points of the survey, $\chi^2(1) = 119.51, p < .001$. A multivariate analysis revealed a small, but significant, multivariate effect of self-esteem, depressive symptoms, and social anxiety on attrition, $F(3, 3179) = 4.57, p < .01, \eta_p^2 = .004$, with somewhat higher levels of social anxiety among those participating at both time points, $F(1, 3181) = 4.34, p < .05, \eta_p^2 = .001$. No significant differences in depressive symptoms or self-esteem were observed. A more detailed analysis of attrition is found in Fröjd et al. (2011).

Statistical Analyses

Descriptive statistics for discrete variables are presented as percentages, and differences in distributions on discrete vari-

Table 1. Multivariate and Univariate Differences in Self-Esteem (RSES), Depressive Symptoms (RBDI), and Social Anxiety (SPIN) at Baseline (T1).

	<i>M</i>		<i>df</i>	<i>F</i>	<i>P</i>	η_p^2
	Girls	Boys				
Multivariate analysis			3, 2016	25.06	<.001	.04
Univariate analyses						
RSES	28.88	30.74	1, 2018	64.77	<.001	.03
RBDI	3.13	1.94	1, 2018	47.74	<.001	.02
SPIN	12.54	11.31	1, 2018	9.99	<.01	.01

Note. RSES = Rosenberg Self-Esteem Scale; RBDI = Beck Depression Inventory–Short Version; SPIN = Social Phobia Inventory.

ables were analyzed with the chi-square (χ^2) test. Descriptive statistics for continuous data are presented as mean \pm standard deviation ($M \pm SD$), and group differences were analyzed using multivariate analyses of variance (MANOVA). Correlation coefficients were assessed according to guidelines provided by Cohen (1992). A repeated-measures MANOVA (doubly multivariate design) was used to assess between-subjects, within-subjects, and interaction effects of depressive symptoms and social anxiety. Group differences based on change in self-esteem were analyzed with MANOVA. Results are presented as test values (F) based on Pillai's Trace and partial eta squared (η_p^2) for effect size. Scheffe's post hoc test was used for multiple group comparisons. Receiver operating characteristic (ROC) curve analyses (van Erkel & Pattynama, 1998) were used to assess the sensitivity and specificity of different cut-points for low self-esteem. The area under the curve (AUC) was used to test the discriminative power. AUC values were assessed using guidelines provided by Hosmer and Lemeshow (2000). PASW Statistics 18 was used for all analyses.

Ethical Considerations

The study was approved by the Pirkanmaa Hospital District Ethics Committee. The ethical considerations of the study follow the guidelines published by the National Advisory Board on Research Ethics (2009).

Results

There were baseline (T1) sex differences on all variables of interest for the present study. Girls had lower self-esteem, more depressive symptoms, and higher levels of social anxiety than boys (Table 1). At baseline, 11.5% of the girls and 6.0% of the boys had depressive symptoms indicating depression, $\chi^2(1) = 18.68, p < .001$. Moreover 10.1% of the girls and 7.8% of the boys had levels of social anxiety indicating social phobia, $\chi^2(1) = 3.44, p = .064$. At follow-up, the corresponding figures for depression were 10.3% versus

Table 2. Correlation Matrix of Self-Esteem (RSES), Depressive Symptoms (RBDI), and Social Anxiety (SPIN) at Baseline (T1) and Follow-up (T2) Separately for Girls (Upper Right Corner) and Boys (Lower Left Corner).

	T1 RSES	T1 RBDI	T1 SPIN	T2 RSES	T2 RBDI	T2 SPIN
T1 RSES		-.66	-.57	.58	-.40	-.39
T1 RBDI	-.50		.53	-.45	.53	.39
T1 SPIN	-.41	.51		-.40	.34	.62
T2 RSES	.47	-.25	-.31		-.65	-.56
T2 RBDI	-.25	.41	.28	-.49		.56
T2 SPIN	-.28	.27	.51	-.49	.61	

Note. RSES = Rosenberg Self-Esteem Scale; RBDI = Beck Depression Inventory–Short Version; SPIN = Social Phobia Inventory. All correlations are significant at the .001 level.

Table 3. Sensitivity, Specificity, PPV, and NPV for Different Cutoffs of Self-Esteem (RSES) in Relation to Concurrent Depression (RBDI).

T1 RSES Cutoff	T1 RBDI ≥ 8							
	Sensitivity ^a		Specificity ^b		PPV ^c		NPV ^d	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
24	0.73	0.57	0.94	0.97	0.61	0.53	0.96	0.97
25	0.79	0.59	0.90	0.95	0.51	0.41	0.97	0.97
26	0.87	0.74	0.84	0.88	0.42	0.28	0.98	0.98
27	0.92	0.83	0.75	0.83	0.33	0.24	0.99	0.99
28	0.92	0.89	0.68	0.78	0.27	0.20	0.99	0.99

Note. RSES = Rosenberg Self-Esteem Scale; RBDI = Beck Depression Inventory–Short Version; PPV, positive predictive value; NPV, negative predictive value. ^aThe proportion of those with depression who scored below the cutoff. ^bThe proportion of those without depression who scored above the cutoff. ^cThe proportion of those scoring below the cutoff with depression. ^dThe proportion of those scoring above the cutoff without depression.

6.4%, $\chi^2(1) = 9.93, p < .01$, and for social phobia 12.5% versus 9.3%, $\chi^2(1) = 5.20, p < .05$. Since there were sex differences in all variables of interest, and particularly because of differences regarding self-esteem, consecutive analyses were performed separately for males and females.

Significant concurrent and prospective correlations ($p < .001$) were found between all variables (Table 2). Low self-esteem at baseline had correlated significantly with concurrent depressive symptoms, $r = -.66$ for girls and $r = -.50$ for boys, as well as with social anxiety, $r = -.57$ for girls and $r = -.41$ for boys. As correlation coefficients ranged from medium to large, using depressive symptoms and social anxiety to assess relevant cut-points for low self-esteem was considered justified.

Using the RSES to discriminate between adolescents with and without depression was successful for both girls (AUC = .93, $p < .001$) and boys (AUC = .91, $p < .001$). Using a cutoff of 25 points, the midpoint of the scale, produced satisfactory discrimination. The suggested cutoff resulted in a sensitivity of 78.8% for girls and 58.5% for boys and a specificity of 90.1% for girls and 94.6% for boys. In other words, the test was able to find four out of five girls and three out of five boys with depression, as measured with the RBDI, without producing a large proportion of false positives. The positive predictive value of the test was 51.0% for girls and 40.8% for

boys (Table 3). In the case of social phobia, using RSES to discriminate caseness worked well for girls, AUC = .83, $p < .001$, and satisfactorily for boys, AUC = .73, $p < .001$. For girls the same cutoff of 25 points as in the case of depression resulted in a reasonable trade-off between sensitivity (62.7%) and specificity (87.2%), but for boys no clear cutoff could be determined (Table 4). All results considered, the ROC analysis provided strongest support for a cutoff of 25 points on the RSES to classify low self-esteem. The decision resulted in 205 (17.9%) of the girls and 76 (8.6%) of the boys being classified as having low self-esteem.

To further assess the potential value of the suggested cutoff of 25 points for low self-esteem, a repeated-measures MANOVA with low (RSES < 25) versus high (RSES ≥ 25) self-esteem as an independent variable and depressive symptoms and social anxiety as dependent variables was performed. Among girls, the analysis revealed significant between-subjects, $F(2, 1134) = 339.61, p < .001, \eta^2 = .38$, within-subjects, $F(2, 1134) = 19.41, p < .001, \eta^2 = .03$, as well as interaction effects, $F(2, 1134) = 29.99, p < .001, \eta^2 = .05$. Girls with low-self esteem differed significantly from girls with high self-esteem regarding depressive symptoms and social anxiety at both time points. Whereas the depressive symptoms among girls with low self-esteem decreased from baseline to follow-up, symptoms of social anxiety

Table 4. Sensitivity, Specificity, PPV, and NPV for Different Cutoffs of Self-Esteem (RSES) in Relation to Concurrent Social Phobia (SPIN).

T1 RSES Cutoff	T1 SPIN \geq 24							
	Sensitivity ^a		Specificity ^b		PPV ^c		NPV ^d	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
24	0.56	0.20	0.91	0.95	0.41	0.25	0.95	0.93
25	0.63	0.25	0.87	0.93	0.36	0.22	0.95	0.94
26	0.72	0.42	0.81	0.87	0.31	0.21	0.96	0.95
27	0.78	0.48	0.73	0.81	0.25	0.18	0.97	0.95
28	0.80	0.61	0.66	0.76	0.21	0.18	0.97	0.96

Note. RSES = Rosenberg Self-Esteem Scale; SPIN = Social Phobia Inventory.

^aThe proportion of those with social phobia who scored below the cutoff. ^bThe proportion of those without social phobia who scored above the cutoff.

^cThe proportion of those scoring below the cutoff with social phobia. ^dThe proportion of those scoring above the cutoff without social phobia.

remained at the baseline level. Among boys, the analysis revealed significant between-subjects, $F(2, 865) = 68.35, p < .001, \eta_p^2 = .14$, within-subjects, $F(2, 865) = 19.77, p < .001, \eta_p^2 = .04$, as well as interaction effects, $F(2, 865) = 27.94, p < .001, \eta_p^2 = .06$. Boys with low-self esteem differed significantly from boys with high self-esteem regarding depressive symptoms and social anxiety at both time points, even though a marked decrease in symptoms of both depression and social anxiety was observed among boys with low self-esteem (Figures 1 and 2).

At baseline, 51.0% of the girls and 40.8% of the boys with low self-esteem scored above the suggested cutoff for depression. Corresponding figures at follow-up were 34.3% and 18.4%. Regarding social anxiety, 36.1% of the girls and 22.4% of the boys scored above the suggested cutoff for social phobia at baseline. Corresponding figures at follow-up were 33.8% and 14.7%. At all comparisons, except for social phobia at follow-up among boys ($p = .53$), girls and boys with low self-esteem differed significantly from their counterparts with high self-esteem ($p < .001$).

Self-esteem was relatively stable over time, $r = .58$ for girls and $r = .47$ for boys. High self-esteem was more stable than low self-esteem with no notable sex differences. Low self-esteem, on the other hand, was more stable among girls than among boys. Half of the girls (49.0%) and 28.9% of the boys with low self-esteem at baseline scored below the cutoff also at follow-up. Participants were divided into four groups based on change in self-esteem from baseline to follow-up: stable low, high-to-low, low-to-high, and stable high RSES. Significant group differences regarding depressive symptoms and social anxiety were found for both girls, $F(6, 2258) = 112.58, p < .001, \eta_p^2 = .23$, and boys, $F(6, 1704) = 47.73, p < .001, \eta_p^2 = .14$. Post hoc tests revealed significant differences between all groups for girls, with highest levels of depressive symptoms and social anxiety in the stable low group followed by the high-to-low, the low-to-high, and the stable high group. Among boys, the stable low and

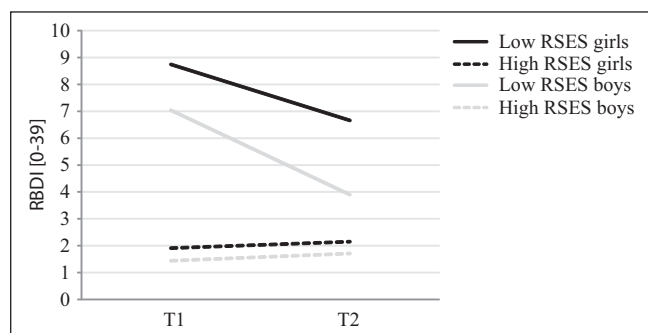


Figure 1. Development of depressive symptoms (RBDI) from baseline to follow-up among girls and boys with low or high self-esteem (RSES).

Note. RBDI = Beck Depression Inventory–Short Version; RSES = Rosenberg Self-Esteem Scale.

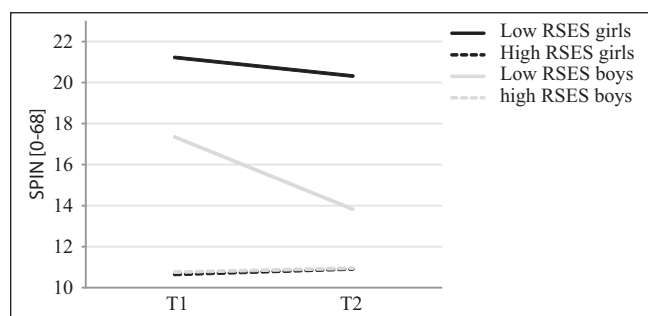


Figure 2. Development of social anxiety (SPIN) from baseline to follow-up among girls and boys with low or high self-esteem (RSES).

Note. SPIN = Social Phobia Inventory; RSES = Rosenberg Self-Esteem Scale.

high-to-low groups formed one subset with significantly more depressive symptoms and social anxiety than the second subset comprising the low-to-high and stable high groups.

Discussion

The present study lends support to the idea that low self-esteem could be used as an indicator of various forms of psychological distress among adolescents. Because of the broad range and intricate nature of psychiatric problems (Rutter, 2011) easily administered nonspecific instruments would be useful to facilitate early detection and intervention. In the present study, ROC curve analysis of self-esteem in relation to depression and social anxiety was able to discriminate well between cases and unaffected girls and boys. A cutoff of 25 points on the RSES (Rosenberg, 1989) resulted in satisfactory sensitivity, specificity, positive predictive value, and negative predictive value. As pointed out in the introductory part of this article, determining a cutoff of a screening test involves both clinical and financial considerations (van Erkel & Pattynama, 1998). Good mental health enables children and adolescents to achieve and maintain optimal psychological and social functioning and well-being as well as a sense of identity and self-worth. Mental health is also crucial for the ability to be productive, to learn, and to tackle developmental challenges (WHO, 2005). Given the current limitations in treatment of mental and behavioral disorders, more resources should be put into preventive strategies (WHO, 2004). Thus, optimizing early detection of adolescents suffering from various psychiatric problems with complex manifestations can facilitate preventive interventions within schools and other important developmental arenas.

The suggested cutoff is the midpoint of the scale and thereby facilitates usage among professionals working with adolescents, for example, school health personnel. Girls with low self-esteem differed from girls with high, above the suggested cutoff, self-esteem with regard to depressive symptoms and social anxiety at both baseline and follow-up. The same pattern was present in boys, except for scores indicating social phobia at follow-up. Depressive symptoms indicating clinical depression was present in nearly half of the girls and boys with low self-esteem at baseline and in one third of the girls and one fifth of the boys at follow-up. Corresponding figures regarding clinically significant levels of social anxiety varied between 15% and 36%. The stability of self-esteem in the present study was in line with previous research (Pullman & Allik, 2000). A stable low self-esteem was associated with highest levels of psychopathology. Also a reduced self-esteem from baseline to follow-up was linked to negative outcomes. On the other hand, adolescents who managed to maintain a stable high or increase their self-esteem manifested significantly lower levels of psychopathology. Low self-esteem is a potential indicator of both concurrent and prospective psychological distress, and the RSES may thus be a functional tool for screening of both disorders.

Tracing the concept of low self-esteem back to the items in the scale, a score below the midpoint of the scale indicates that the person is inclined to feel that he or she is unworthy, has few good qualities, is a failure, is unable to do things as

well as others, has not much to be proud of, and wishes to have more self-respect (Rosenberg, 1989). Self-esteem is important not only on an emotional level, but it also has implications for social interaction. A high self-esteem enables adolescents to explore various opportunities and to pursue their goals in life (Baumeister et al., 2003; Swann et al., 2007).

Self-esteem, depressiveness, and social anxiety are closely related phenomena (Hofmann, 2007; Lewinsohn et al., 1997; MacPhee & Andrews, 2006; Schmitz et al., 2003). Self-esteem is strongly correlated to the personality dimension of neuroticism (Pullman & Allik, 2000), and self-esteem probably functions as a risk factor for, constitutes a part of, and may be a result of depression and anxiety, as well as other psychiatric problems. Because of these relationships, self-esteem could well be lifted as a primary focus for identification of adolescents at risk for later psychopathology. Self-esteem is a core element of and a natural basis for a broad-spectrum approach of mental health promotion (Mann, Hosman, Schaalma, & de Vries, 2004). The stability and variation, not just the present level, of self-esteem is important (Pullman & Allik, 2000) and self-esteem monitored over time could provide insights about emerging psychopathology and positive development in adolescence.

The present study was based on a large population sample. Virtually all adolescents in Finland attend comprehensive school and the present cohort may thus be considered representative of the age-group studied (Finnish National Board of Education, 2008). The main aim of the study was not to analyze the frequency of internalizing disorders, and as a result representativeness is not crucial to the generalisability of the results. The response rate in the Adolescent Mental Health Cohort baseline survey was good. However, attrition at T2 was relatively high. Still, there is no particular reason to assume that attrition would significantly influence associations between the phenomena studied (Van Loon, Tijhuis, Picavet, Surtees, & Ormel, 2003).

One limitation of this study was the lack of diagnostic interviews. However, the measures of the present study have been used previously in large community samples of adolescents and have demonstrated good reliability and validity (Raitasalo, 2007; Ranta, Kaltiala-Heino, Rantanen, et al., 2007; Rosenberg, 1989). Given that instruments are developmentally appropriate, children and adolescents are able to reliably report on their health (Christian, Pearce, Roberson, & Rothwell, 2010; Riley, 2004). Self-reported depressive symptoms have been shown to be fairly stable and important predictors of impairment of functioning (Aalto-Setälä, Marttunen, Tuulio-Henriksson, Poikolainen, & Lönnqvist, 2002; Charman, 1994).

Conclusion

The present study has gone some way toward understanding the associations between low self-esteem, depression, and

anxiety. A general conclusion is that low self-esteem is worth further study as a potential focus for identifying adolescents in risk of internalizing psychopathology. The RSES is an easily administered instrument and the midpoint of the scale can be used as a cutoff for low self-esteem, which enhances its utility in, for example, school settings. However, further assessment of the instrument in relation to other forms of psychopathology, for instance, externalizing behavior, is needed.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article:

Funding for this study was provided by the Yrjö Jahnsson Foundation, the Finnish Cultural Foundation, and Pirkanmaa Hospital District (Tampere University Hospital) Competitive Research Funding.

References

- Aalto-Setälä, T., Marttunen, M., Tuulio-Henriksson, A., Poikolainen, K., & Lönnqvist, J. (2002). Depressive symptoms in adolescence as predictors of early adulthood depressive disorders and maladjustment. *American Journal of Psychiatry, 159*, 1235-1237.
- Alden, L. E., & Mellings, T. M. (2004). Generalized social phobia and social judgments: The salience of self- and partner-information. *Journal of Anxiety Disorders, 18*, 143-157.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., Text revision). Washington, DC: Author.
- Angold, A., & Costello, E. J. (1993). Depressive comorbidity in children and adolescents: empirical, theoretical, and methodological issues. *American Journal of Psychiatry, 150*, 1779-1791.
- Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science in the Public Interest, 4*, 1-44.
- Beck, A. T., & Beck, R. W. (1972). Screening depressed patients in family practice. A rapid technic. *Postgraduate Medicine, 52*, 81-85.
- Beck, A. T., Rial, W. Y., & Rickels, K. (1974). Short form of depression inventory: Cross-validation. *Psychological Reports, 34*, 1184-1186.
- Bennett, D. S., Ambrosini, P. J., Bianchi, M., Barnett, D., Metz, C., & Rabinovich, H. (1997). Relationship of Beck Depression Inventory factors to depression among adolescents. *Journal of Affective Disorders, 45*, 127-134.
- Buhrmester, M. D., Blanton, H., & Swann, W. B. (2011). Implicit self-esteem: Nature, measurement, and a new way forward. *Journal of Personality and Social Psychology, 100*, 365-385.
- Charman, T. (1994). The stability of depressed mood in young adolescents: A school-based survey. *Journal of Affective Disorders, 30*, 109-116.
- Christian, B. J., Pearce, P. F., Roberson, A. J., & Rothwell, E. (2010). It's a small, small world: Data collection strategies for research with children and adolescents. *Journal of Pediatric Nursing, 25*, 202-214.
- Cicchetti, D., & Rogosch, F. A. (2002). A developmental psychopathology perspective on adolescence. *Journal of Consulting and Clinical Psychology, 70*, 6-20.
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155-159.
- Commission on Adolescent Anxiety Disorders. (2005). In D. L. Evans, E. B. Foa, R. E. Gur, H. Hendin, C. P. O'Brien, M. E. Seligman, & B. T. Walsh (Eds.), *Treating and preventing adolescent mental health disorders* (pp. 161-253). New York, NY: Oxford University Press.
- Commission on Adolescent Depression and Bipolar Disorder. (2005). Depression and bipolar disorder. In D. L. Evans, E. B. Foa, R. E. Gur, H. Hendin, C. P. O'Brien, M. E. Seligman, & B. T. Walsh (Eds.), *Treating and preventing adolescent mental health disorders* (pp. 3-74). New York, NY: Oxford University Press.
- Connor, K. M., Davidson, J. R., Churchill, L. E., Sherwood, A., Foa, E., & Weisler, R. H. (2000). Psychometric properties of the Social Phobia Inventory (SPIN): New self-rating scale. *British Journal of Psychiatry, 176*, 379-386.
- Erikson, E. H. (1980). *Identity and the life cycle*. New York, NY: W. W. Norton.
- Evans, D. L., & Seligman, M. E. (2005). Introduction. In D. L. Evans, E. B. Foa, R. E. Gur, H. Hendin, C. P. O'Brien, M. E. Seligman, & B. T. Walsh (Eds.), *Treating and preventing adolescent mental health disorders* (pp. xxv-xl). New York, NY: Oxford University Press.
- Finnish National Board of Education. (2008). *Education in Finland*. Helsinki, Finland: Author.
- Fröjd, S., Kaltiala-Heino, R., & Marttunen, M. (2011). Does problem behaviour affect attrition from a cohort study on adolescent mental health? *European Journal of Public Health, 21*, 306-310.
- Fröjd, S., Marttunen, M., Pelkonen, M., von der Pahlen, B., & Kaltiala-Heino, R. (2006). Perceived financial difficulties and maladjustment outcomes in adolescence. *European Journal of Public Health, 16*, 542-548.
- Fröjd, S., Marttunen, M., Pelkonen, M., von der Pahlen, B., & Kaltiala-Heino, R. (2007). Adult and peer involvement in help-seeking for depression in adolescent population: A two-year follow-up in Finland. *Social Psychiatry and Psychiatric Epidemiology, 42*, 945-952.
- Guttman, L. (1950). The basis for scalogram analysis. In S. A. Stouffer, L. Guttman, E. A. Suchman, P. F. Lazarsfeld, S. A. Star, & J. A. Clausen (Eds.), *Studies in social psychology in World War II: Vol. 4. Measurement and prediction*. Princeton, NJ: Princeton University Press.
- Haarasilta, L., Marttunen, M., Kaprio, J., & Aro, H. (2001). The 12-month prevalence and characteristics of major depressive episode in a representative nationwide sample of adolescents and young adults. *Psychological Medicine, 31*, 1169-1179.
- Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: a comprehensive model and its treatment implications. *Cognitive Behaviour Therapy, 36*, 193-209.

- Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression* (2nd ed.). New York, NY: Wiley.
- Johnson, H. S., Inderbitzen-Nolan, H. M., & Anderson, E. R. (2006). The Social Phobia Inventory: validity and reliability in an adolescent community sample. *Psychological Assessment, 18*, 269-277.
- Kaltiala-Heino, R., Rimpelä, M., Rantanen, P., & Laippala, P. (1999). Finnish modification of the 13-item Beck Depression Inventory in screening an adolescent population for depressiveness and positive mood. *Nordic Journal of Psychiatry, 53*, 451-457.
- Kessler, R. C., Avenevoli, S., & Merikangas, K. R. (2001). Mood disorders in children and adolescents: An epidemiologic perspective. *Biological Psychiatry, 15*, 1002-1014.
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey replication. *Archives of General Psychiatry, 62*, 593-602.
- Lewinsohn, P. M., Zinbarg, R., Seeley, J., Lewinsohn, M., & Sack, W. (1997). Lifetime comorbidity among anxiety disorders and between anxiety disorders and other mental disorders in adolescents. *Journal of Anxiety Disorders, 11*, 377-394.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology, 140*, 1-55.
- Loong, T. (2003). Understanding sensitivity and specificity with the right side of the brain. *British Medical Journal, 327*, 716-719.
- MacPhee, A. R., & Andrews, J. W. (2006). Risk factors for depression in early adolescence. *Adolescence, 41*, 435-466.
- Mann, M., Hosman, C. M., Schaalma, H. P., & de Vries, N. K. (2004). Self-esteem in a broad-spectrum approach for mental health promotion. *Health Education Research, 19*, 357-372.
- Marcotte, D., Fortin, L., Potvin, P., & Papillon, M. (2002). Gender differences in depressive symptoms during adolescence: Role of gender-typed characteristics, self-esteem, body image, stressful life events, and pubertal status. *Journal of Emotional and Behavioral Disorders, 10*, 29-42.
- The Morris Rosenberg Foundation. (2011). *The Rosenberg Self-Esteem Scale*. Retrieved from <http://www.bsos.umd.edu/soc/research/rosenberg.htm>
- Muris, P., Schmidt, H., Lambrichs, R., & Meesters, C. (2001). Protective and vulnerability factors of depression in normal adolescents. *Behaviour Research and Therapy, 39*, 555-565.
- National Advisory Board on Research Ethics. (2009). *Ethical principles of research in the humanities and social and behavioural sciences and proposals for ethical review*. Retrieved from <http://www.tenk.fi/ENG/Publicationsguidelines/ethicalprinciples.pdf>
- Newman, D. L., Moffitt, T. E., Caspi, A., Magdol, L., Silva, P. A., & Stanton, W. R. (1996). Psychiatric disorders in a birth cohort of young adults: Prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *Journal of Consulting and Clinical Psychology, 64*, 552-562.
- Pullman, H., & Allik, J. (2000). The Rosenberg Self-Esteem Scale: Its dimensionality, stability and personality correlates in Estonian. *Personality and Individual Differences, 28*, 701-715.
- Raitasalo, R. (2007). *Mood questionnaire. Finnish modification of the short form of the Beck Depression Inventory measuring depression symptoms and self-esteem*. Helsinki, Finland: Sosiaali- ja terveysturvan tutkimuksia.
- Ranta, K., Kaltiala-Heino, R., Koivisto, A., Tuomisto, M., Pelkonen, M., & Marttunen, M. (2007). Age and gender differences in social anxiety symptoms during adolescence: The Social Phobia Inventory (SPIN) as a measure. *Psychiatry Research, 153*, 261-270.
- Ranta, K., Kaltiala-Heino, R., Rantanen, P., & Marttunen, M. (2009). Social phobia in Finnish general adolescent population: Prevalence, comorbidity, individual and family correlates, and service use. *Depression and Anxiety, 26*, 528-536.
- Ranta, K., Kaltiala-Heino, R., Rantanen, P., Tuomisto, M. T., & Marttunen, M. (2007). Screening social phobia in adolescents from general population: The validity of the Social Phobia Inventory (SPIN) against a clinical interview. *European Psychiatry, 22*, 224-251.
- Riley, A. W. (2004). Evidence that school-age children can self-report on their health. *Ambulatory Pediatrics, 4*, 371-376.
- Robertson, J. F., & Simons, R. L. (1989). Family factors, self-esteem, and adolescent depression. *Journal of Marriage and the Family, 51*, 125-138.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Rosenberg, M. (1989). *Society and the adolescent self-image. Revised version*. Middletown, CT: Wesleyan University Press.
- Rutter, M. (2011). Research review: Child psychiatric diagnosis and classification: Concepts, findings, challenges and potential. *Journal of Child Psychology and Psychiatry, 52*, 647-660.
- Schmitt, D. P., & Allik, J. (2005). Simultaneous administration of the Rosenberg Self-Esteem Scale in 53 nations: Exploring the universal and culture-specific features of global self-esteem. *Journal of Personality and Social Psychology, 89*, 623-642.
- Schmitz, N., Kugler, J., & Rollnik, J. (2003). On the relation between neuroticism, self-esteem, and depression: results from the National Comorbidity Survey. *Comprehensive Psychiatry, 44*, 169-176.
- Swann, W. B., Jr., Chang-Schneider, C., & McClarty, K. L. (2007). Do people's self-views matter? Self-concept and self-esteem in everyday life. *American Psychologist, 62*, 84-94.
- van Erkel, A. R., & Pattynama, P. M. (1998). Receiver operating characteristic (ROC) analysis: Basic principles and applications in radiology. *European Journal of Radiology, 27*, 88-94.
- Van Loon, J. M., Tjihuis, M., Picavet, H. S., Surtees, P. G., & Ormel, J. (2003). Survey non-response in the Netherlands: Effects on prevalence estimates and associations. *Annals of Epidemiology, 13*, 105-110.
- Wallace, G. R. (1988). *RSE-40: An alternate scoring system for the Rosenberg Self-Esteem Scale (RSE)*. Washington, DC: ERIC Clearinghouse.
- Wittchen, H. U., Jacobi, F., Rehm, J., Gustavsson, A., Svensson, M., Jönsson, B., . . . Steinhausen, H. C. (2011). The size and burden of mental disorders and other disorders of the brain in Europe 2010. *European Neuropsychopharmacology, 21*, 655-679.
- World Health Organization. (2004). *Prevention of mental disorders: Effective interventions and policy options. Summary report*. Geneva, Switzerland: Author.
- World Health Organization. (2005). *Child and adolescent mental health: Policies and plans*. Geneva, Switzerland: Author.

RESEARCH ARTICLE

Open Access

Decrease in self-esteem mediates the association between symptoms of social phobia and depression in middle adolescence in a sex-specific manner: a 2-year follow-up of a prospective population cohort study

Juha-Matti Väänänen^{1*}, Rasmus Isomaa², Riittakerttu Kaltiala-Heino³, Sari Fröjd⁴, Mika Helminen⁵ and Mauri Marttunen^{6,7}

Abstract

Background: Social phobia and depression are common, highly comorbid disorders in middle adolescence. The mechanism underlying this comorbidity, however, is unclear. Decrease in self-esteem caused by the initial disorder might play a decisive role in the development of the subsequent disorder. The present study aimed to determine whether the association between symptoms of social phobia and depression is mediated by decrease in self-esteem in mid-adolescent girls and boys.

Methods: As a part of the prospective Adolescent Mental Health Cohort (AMCH), subjects of this study were 9th grade pupils (mean age, 15.5) responding to a survey conducted in 2002–2003 (T1) and to a 2-year follow-up survey in 2004–2005 (T2) (N = 2070, mean age 17.6 years, 54.5% girls).

Results: Symptoms of social phobia without symptoms of depression at age 15 and symptoms of depression at age 17 were associated only among boys, and this association was mediated by decrease in self-esteem. Symptoms of depression without symptoms of social phobia at age 15 and symptoms of social phobia at age 17 were associated only among girls, and this association was partially mediated by decrease in self-esteem.

Conclusions: Decrease in self-esteem plays a decisive role in the association between social phobia and depression. Self-esteem should be a key focus in interventions for adolescents suffering from social phobia or depression. Efficient intervention for the first disorder might help to prevent the decline in self-esteem and thus the incidence of the subsequent disorder. These findings are based on a sample of Finnish adolescents and should be confirmed in other jurisdictions or in more ethnically diverse samples.

Keywords: Social phobia, Depression, Adolescence, Self-esteem, Risk factor, Sex differences, Anxiety

* Correspondence: juha.vaananen@pshp.fi

¹Department of Adolescent Psychiatry, Tampere University Hospital, Box 2000, Tampere 33521, Finland

Full list of author information is available at the end of the article

Background

Social phobia and depression are common disorders among adolescents [1-4]. These disorders are also highly comorbid with each other [3-5]. Social phobia may cause psychologic and functional deterioration leading to depression [6]. The two disorders may share underlying risk factors [7]. Further, anxiety and depression could be different manifestations of the same disorder across the course of this condition (e.g., anxiety is prominent in the early phases, and depression is prominent in later stages) [6,7].

Decrease in self-esteem is a possible indicator of psychosocial deterioration due to social phobia leading to subsequent depression, or, due to depression leading to subsequent social phobia. According to Rosenberg (1965), self-esteem is the direction of self-attitude, a favorable or unfavorable opinion of oneself. High self-esteem is the feeling that one is good enough. An individual with high self-esteem respects him/herself, and considers him/herself worthy [8].

Many studies have reported an association between low self-esteem and psychiatric disorders, especially depression, in adolescence [8-10]. Low self-esteem in adolescence predicts, and is a risk factor for, depression [11,12], while high self-esteem may protect against depression [13,14]. Rosenberg's study in 1965 revealed that self-esteem is associated with anxiety disorders, and based on studies on the cognitive theories of social phobia [15], low self-esteem likely has an important role in adolescents suffering from social phobia. To the best of the authors' knowledge, however, there are no adolescent population follow-up studies on low self-esteem as a risk factor for subsequent social phobia. A study among young adults showed that low self-esteem correlates with social phobia [16].

Depression among adolescents [17], and social phobia among young adults [16], and adults [18] is cross-sectionally associated with low self-esteem. Thus decrease in self-esteem might be a mediating factor between earlier social phobia and subsequent depression, or between earlier depression and subsequent social phobia. The mediating role of self-esteem, as far as the authors know, has not yet been studied.

There are sex differences in depression, social phobia, and self-esteem. Depression is more common among boys in childhood, but it is more prevalent among girls in adolescence. Female sex has also been reported to be a risk factor for depression [19,20] and its consequences [21,22]. The prevalence of social phobia is higher among girls than boys [4,23,24]. Among girls, comorbid depression emerges within a shorter interval after preceding social phobia than among boys [5]. In an earlier analysis of the present sample, social phobia predicted depression among boys, while depression predicted social

phobia among girls [25]. Self-esteem is lower among girls than boys [26,27], and while self-esteem increases among boys during adolescence, the level of self-esteem throughout adolescence is not consistent among girls [27]. Some studies suggest that low self-esteem is a risk factor for depression among girls, but not among boys [12,22], while another indicates that low self-esteem is a strong risk factor for depression for both sexes [11].

Aims of the present study

Low self-esteem is associated with social phobia and depression during adolescence. The role of low self-esteem in the development of the comorbidity between social phobia and depression, however, remains unclear. Prospective population studies among adolescents on the role of low self-esteem in the association between social phobia and depression are lacking. The main aim of the present adolescent cohort study was to examine whether the association between symptoms of social phobia and subsequent symptoms of depression or vice versa are mediated by decrease in self-esteem. Other aims of this study were to cross-sectionally examine how self-esteem is associated with symptoms of social phobia, symptoms of depression, and comorbid symptoms of social phobia and depression in adolescence, and to study sex differences in adolescent self-esteem and in the interplay between self-esteem, symptoms of depression, and symptoms of social phobia. We expected that 1) the associations between symptoms of social phobia and subsequent symptoms of depression among boys, and between symptoms of depression and subsequent symptoms of social phobia among girls would be mediated by decrease in self-esteem; 2) that adolescents with symptoms of social phobia, symptoms of depression, or comorbid disorders would have lower self-esteem than those without these symptoms; and 3) that boys would have higher self-esteem than girls.

Methods

Study sample and procedures

This study is part of an ongoing prospective cohort study, the Adolescent Mental Health Cohort (AMHC) study, conducted in two Finnish cities, Tampere (population 200,000) and Vantaa (population 180,000). The data collection, procedures, and measures of the study are reported in detail elsewhere [28,29]. Briefly, at the time of the baseline survey (T1), data were collected from a survey completed by ninth graders during school under the supervision of a teacher in all Finnish-speaking secondary schools in the two cities. For students absent from school that day, another opportunity to participate was offered in the school within a couple of weeks. If a student was not present on either occasion, the questionnaires were sent twice to the student by post. If no reply

was received, the student was concluded to be unwilling to participate. Eligible survey participants at the 2-year follow-up (T2) were students who had participated at T1. Multiple approaches were used to contact the adolescents at follow-up. School-based surveys like that at T1 were organized in upper secondary schools and vocational schools. Adolescents not reached through schools were contacted by postal survey. Finally, the same survey was offered via the Internet to those who had not responded via their schools or by post.

The subjects of the present study were students responding to a survey conducted in 2002–2003 (T1) and at a 2-year follow-up in 2004–2005 (T2). The baseline sample comprised 1609 girls and 1669 boys with a mean \pm sd age of 15.5 ± 0.39 years. Of the respondents, 69% were living in two-parent families. The distribution of the subjects' parents' highest education was (father/mother): 16%/13% comprehensive school only, 40%/30% primary school and vocational school, 17%/31% high school with or without vocational school, and 28%/26% academic degree [28].

A total of 2070 adolescents completed the survey at T1 and at T2, and 54.5% of the respondents who completed both surveys were girls. Mean \pm sd age at T2 was 17.6 ± 0.4 years. Subjects not answering all the questions on symptoms of social phobia or depression ($N = 32$) were excluded from the analyses, and the final sample comprised 2038 subjects, 1154 girls and 884 boys. Sample sizes varied somewhat in the different analyses depending on baseline defaults (subsamples of being free of both SP and DEP at T1, or being free of one or the other of these disorders at T1) of each analysis.

This study was approved by the Pirkanmaa Hospital District Ethics committee, and the Tampere and Vantaa Research Approval Boards. The Finnish legislation on medical research allows subjects of age 15 years and older to provide consent. Although parental consent for participation was not required, the parents of the subjects were informed in advance by a letter.

Drop-out

The response rate at T2 was 63.1% (2070/3278) of the baseline sample. Compared to responders of both surveys, non-responders at T2 were more likely to be boys (63.4% vs. girls 36.6%; $p < 0.001$) and more likely to have symptoms of depression (11.7% vs. 9.1%, $p = 0.020$). Attrition was not associated with symptoms of social phobia (65.1% vs. 63.1%, $p = 0.523$) or self-esteem (mean 29.68 vs. 29.61, $p = 0.710$). Both parents' educational level was more often comprehensive school only or lower among those who did not answer at T2 (father 18.9% vs. 15.1%, $p = 0.005$, mother 16.1% vs. 12.2%, $p = 0.002$). Not living with both biologic parents was also more common among drop-outs (35.2% vs. 27.5%, $p < 0.001$).

Measures

Symptoms of depression

We used the Finnish modification of the 13-item Beck Depression Inventory (RBDI) [30] to assess symptoms of depression (DEP) [31,32]. The RBDI is a widely used self-report scale measuring the severity of depressive symptoms, and its reliability and validity are good [33]. A cut-off point of 8 predicts a diagnosis of depression by a structured interview (SCAN) with good sensitivity (0.93) and specificity (0.88) [34]. The RBDI is an appropriate method for measuring depression in Finnish adolescents in population studies [30,35]. Each item is scored from 0–3 according to the severity of the symptom. Sum scores of 13 items (range 0–39) were dichotomized to non/mild depression (scores 0–7) and moderate/severe depression (scores 8–39) [31].

Symptoms of social phobia

The Social Phobia Inventory (SPIN) [36], a 17-item self-report questionnaire on a 5-point Likert-type scale, was used to measure symptoms of social phobia (SP). The scale was demonstrated to have good reliability and construct validity when used among English-speaking and Finnish adolescents [37,38]. Sum scores of the SPIN were used to identify participants with SP. For the Finnish translation of the SPIN, a cut-off point of 24 has 81.8% sensitivity and 85.1% specificity for a diagnosis of SP [38], and this cut-off point was used in the present study.

Self-esteem

Self-esteem (SE) was measured using the Finnish translation of the Rosenberg Self-Esteem Scale (RSES) [8]. The RSES is a 10-item scale that measures self-esteem, with 5 items reflecting high self-esteem and 5 reflecting low SE. In each item, participants were asked to indicate their agreement to statements on a four-point scale (1 = strongly agree to 4 = strongly disagree). We scored the answers from 1 to 4 on each item, scoring a total sum from 10 to 40; the higher the sum score, the higher the SE. We used continuous sum scores of the RSES in our analysis. The RSES was originally tested on a large sample of high-school students and found to have good face validity in an adolescent population [8]. Since then, the RSES has been widely used in adolescent studies in many countries [11,27].

Missing values

Cases were excluded if more than three items of our measures were unanswered. If three or fewer items were unanswered, missing values were replaced with the mean value of the subject's responses to the other items of the scale.

Covariates

The covariates controlled for in the statistical analyses were age, family structure (living with both biologic parents/living in some other family structure), both parents' highest educational qualification (comprehensive school only/higher education), and externalizing symptoms, measured by the Youth Self Report [39], at T1. The externalizing scale of the Youth Self Report as a continuous sum score was used in the present study. These covariates were selected because earlier studies suggested that these covariates impact the main variables of interest in the present study [8,13,20,40,41].

Statistical analyses

Group comparisons

The study sample was divided into four groups according to disorder status: adolescents without symptoms of social phobia or symptoms of depression (no-SP/DEP; SPIN score <24, R-BDI score <8), with symptoms of social phobia and without symptoms of depression (SP; SPIN \geq 24, R-BDI <8), with symptoms of depression and without symptoms of social phobia (DEP; SPIN <24, R-BDI \geq 8), and with both symptoms of social phobia and symptoms of depression (comorbid-SP/DEP; SPIN \geq 24, R-BDI \geq 8). Descriptive statistics are provided for the RSES sum score according to current SP, DEP, or comorbid-SP/DEP at T1 and T2 for the whole sample and separately for girls and boys.

Mediation

Baron and Kenny (1986) pointed out that an association between two variables (a) and (b) is mediated by a third variable (c) if 1) there is an association between variable (a) at T1 and variable (b) at T2, 2) variable (a) at T1 is associated with a third variable (c), 3) the third variable (c) is associated with variable (b) at T2, and 4) the association between variables (a) at T1 and (b) at T2 disappears after adding the variable (c) into the model, and these authors called this a perfect mediation. If the association between variables (a) at T1 and (b) at T2 persists but weakens, it is called a partial mediation [42].

Decrease in SE as a mediating factor

We examined whether decreased SE is a mediating factor of the association of SP at T1 to DEP with or without SP at T2 (N = 1852, girls n = 1021, boys n = 831), and DEP at T1 to SP with or without DEP at T2 (N = 1854, girls n = 1038, boys n = 816) by logistic regression analyses as described by Baron and Kenny (1986). We named the proposed mediating factor 'change in SE from T1 to T2', that is [SE at T2 - SE at T1]. If SE increased from T1 to T2, 'change in SE from T1 to T2' would be positive, and if SE decreases, it would be negative. We evaluated the impact of SP or DEP at T1 on 'change in

self esteem between T1 and T2' by binary logistic regression analysis. Next, we added, 'change in SE from T1 to T2', and covariates, to binary logistic regressions. Two logistic regression analyses were performed. In the first, SP at T1 was the independent variable and DEP with or without SP at T2 was the dependent variable. In the second analysis, DEP at T1 was the independent variable and SP with or without DEP was the dependent variable. To avoid the confounding effect of baseline SE, we controlled SE at T1 in our model. We performed a logistic regression analysis to determine the association between SE at T1 and SP or DEP at T2 in a subsample of no-SP/DEP at T1.

In the logistic regression analyses, odds ratio (OR) with 95% confidence interval (CI) was used to show associations between independent and dependent variables of the model. A p-value of less than 0.05 was considered to indicate statistical significance. Statistical significance tests were two-tailed.

The data analyses were performed using SPSS, version 16.0 (SPSS Inc., Chicago, IL, USA).

Results

Self-esteem according to symptoms of depression and symptoms of social phobia

Boys had higher RSES scores than girls at ages 15 and 17 in the whole sample and in the no-SP/DEP group. In addition, the self-esteem of boys was significantly higher than that of girls at age 15 in the SP group and at age 17 in the comorbid-SP/DEP group. The RSES scores were significantly lower in all disorder groups compared to the no-SP/DEP group at both age 15 and 17 in both sexes (Table 1). When the disorder groups were compared, current SE was highest in the SP group in both sexes at both ages. Among girls, SE was also lower in the comorbid-SP/DEP than in the DEP group (Table 1).

Self-esteem as a mediator of the association between symptoms of social phobia and symptoms of depression

SP at T1 was significantly associated with DEP with or without SP at T2 only among boys (boys, n = 831, OR = 3.67, 95% CI = 1.54-8.76, p = 0.003, girls n = 1021, OR = 2.11, 95% CI = 0.85-5.14, ns). SP at T1 was associated with 'change in SE from T1 to T2', and 'change in SE from T1 to T2' was associated with DEP with or without SP at T2. The addition of 'change in SE from T1 to T2' into the model, made the association of SP at T1 with DEP with or without SP at T2 non-significant. Thus, the association of SP at T1 with DEP with or without SP at T2 among boys was mediated by 'change in SE from T1 to T2' when controlling for SE at T1 (Figure 1).

DEP at T1 was a significant predictor of SP with or without DEP at T2 only among girls (girls, n = 1038, OR = 7.79, 95% CI = 4.53-13.39, p < 0.001, boys n = 816, OR = 2.47, 95% CI = 0.92-6.66, ns). DEP at T1 was

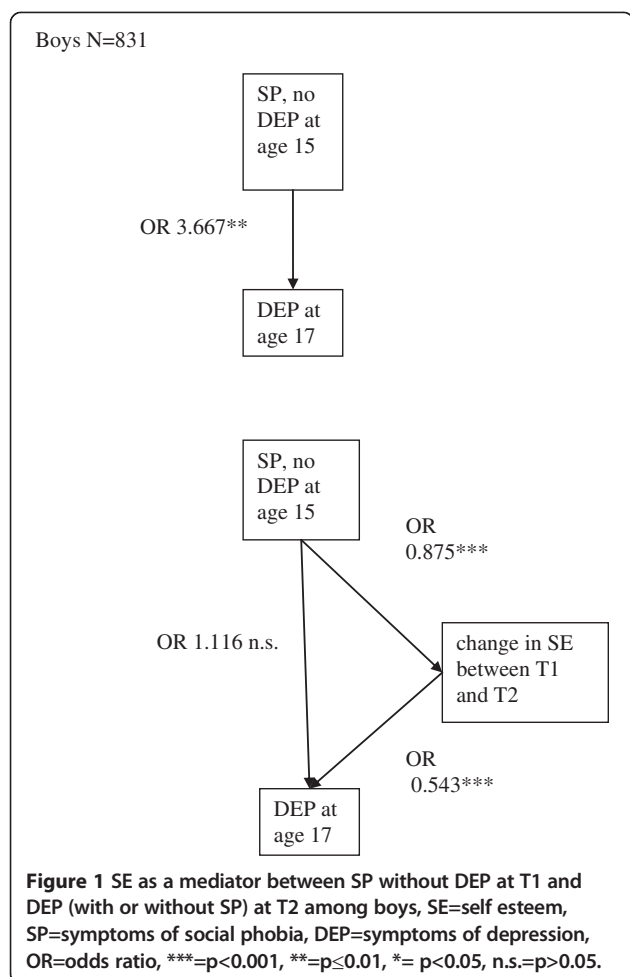
Table 1 Means of Rosenberg Self-Esteem Scale at 15 and at 17, among boys and girls

		15 y				17 y			
		All	Boys	Girls	p ⁽²⁾	All	Boys	Girls	p ⁽²⁾
Current disorder status at 15 or at 17	No-SP/ DEP	30.7	31.4	30.1	<0.001 ⁽²⁾	31.6	32.3	31.1	<0.001 ⁽²⁾
		N = 1723	N = 775	N = 948		N = 1720	N = 767	N = 953	
	SP	27.3	28.6*** ⁽¹⁾	26.1*** ⁽¹⁾	=0.004 ⁽²⁾	27.2	27.6*** ⁽¹⁾	26.9*** ⁽¹⁾	ns ⁽²⁾
		N = 108	N = 50	N = 58		N = 129	N = 48	N = 81	
	DEP	23.0	23.5*** ⁽¹⁾	22.7*** ⁽¹⁾	ns ⁽²⁾	23.0	22.5*** ⁽¹⁾	23.2*** ⁽¹⁾	ns ⁽²⁾
	N = 107	N = 35	N = 72		N = 80	N = 23	N = 57		
	Com-SP/ DEP	19.8	20.6*** ⁽¹⁾	19.6*** ⁽¹⁾	ns ⁽²⁾	20.9	22.6*** ⁽¹⁾	19.9*** ⁽¹⁾	=0.006 ⁽²⁾
		N = 78	N = 18	N = 60		N = 96	N = 34	N = 62	
	All	29.7	30.8	28.9	<0.001 ⁽²⁾	30.5	31.4	29.8	<0.001 ⁽²⁾
		N = 2016	N = 878	N = 1138		N = 2025	N = 872	N = 1153	

no-SP/DEP = no symptoms of social phobia or depression (SPIN score <24, R-BDI score <8), SP = symptoms of social phobia without symptoms of depression (SPIN ≥24, R-BDI <8), DEP = symptoms of depression without symptoms of social phobia (SPIN <24, R-BDI ≥8) com-SP/DEP = comorbid symptoms of social phobia and depression (SPIN ≥24, R-BDI ≥8).

⁽¹⁾ = Statistical significance of differences between disorders to no SP no DEP group, Mann-Whitney -test, *** = p < 0.001.

⁽²⁾ = Statistical significance of differences between boys and girls, Mann-Whitney-test.



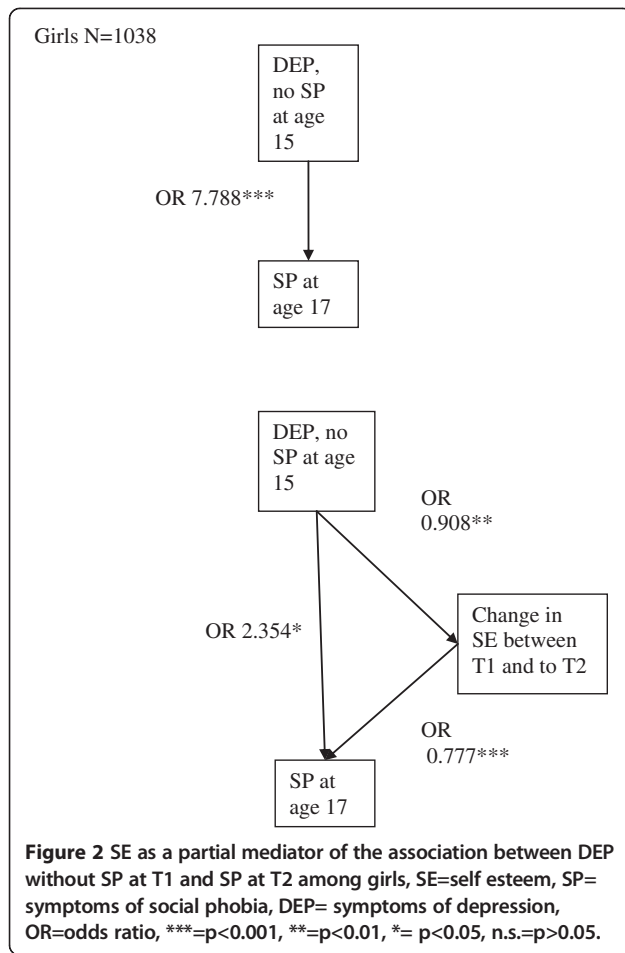
associated with 'change in SE from T1 to T2', and 'change in SE from T1 to T2' was associated with SP with or without DEP at T2. Although adding 'change in SE from T1 to T2' affected the OR of the association between DEP at T1 and SP with or without DEP at T2, the association remained statistically significant. Thus, among girls, the association between DEP without SP at T1 and SP at T2 was partially mediated by the 'change in SE from T1 to T2' when controlling for SE at T1 (Figure 2).

Among girls, there was a significant association between DEP at T1 and 'change in SE between T1 and T2' (Figure 2), while there was no statistically significant association between SP at T1 and 'change in SE from T1 to T2' when SE at T1 was controlled for (OR = 0.96, 95% CI = 0.90-1.02, ns). Among boys, SP at T1 was associated with 'change in SE between T1 and T2' (Figure 1), whereas DEP at T1 was not associated with 'change in SE from T1 to T2' (OR = 0.97, 95% CI 0.89-1.04, ns) when controlling for SE at T1.

Among boys in the no-SP/DEP group, SE at T1 was not associated with DEP at T2 in the model with all covariates (OR = 0.92, 95% CI 0.84-1.01, ns). Among girls, SE at T1 was significantly associated with SP at T2 after adding covariates to the analysis (OR 0.91, 95% CI 0.85-0.98, p = 0.01) in the no-SP/DEP group at T1.

Discussion

Our main hypothesis that decrease in self-esteem mediates the associations of earlier symptoms of social phobia without symptoms of depression and subsequent symptoms of depression (boys), or symptoms of depression without symptoms of social phobia and subsequent symptoms of social phobia (girls) was supported. Among boys, the association between symptoms of social phobia without symptoms of depression at 15 and symptoms of



depression at 17 was mediated by decrease in self-esteem. This mediation was perfect based on the definition of Baron and Kelly (1986). Among girls, the association between symptoms of depression without symptoms of social phobia and subsequent symptoms of social phobia was partially mediated by decrease in self-esteem.

To the best of our knowledge, the mediating role of decrease in self-esteem in the associations between social phobia and depression in adolescence has not been investigated. Although decrease in self-esteem emerged only as a partial mediator between symptoms of depression and subsequent symptoms of social phobia among girls, this finding is noteworthy. As Baron and Kelly (1986) noted, "in psychological research a perfect mediation is a rare phenomena, but also in partial mediation, a significant reduction in the association between independent and dependent variable, demonstrates that a given mediator indeed is a potent, albeit not both necessary and sufficient condition for an effect to occur".

Our findings are in accordance with sociometric theory that self-esteem is affected by the degree to which a person is included/accepted or excluded/rejected by others [43]. In both social phobia and depression, there is

perceived exclusion or rejection by others. Perceived acceptance or rejection by others affects self-esteem especially strongly during adolescence [43]. Decrease in self-esteem during adolescence further leads to the development of a subsequent disorder (depression or social phobia).

Dumont and Provost (1999) reported that low self-esteem is associated with avoidance as a coping style and high self-esteem is associated with active problem-solving as a coping style. Thus, they speculated that the association between self-esteem and depression is mediated by the coping style. As avoidance is one of the main characteristics of social phobia, this association might also be true in our study, and the role of the coping style in the associations detected in our study warrants further study [44].

In cross-sectional analyses, low self-esteem at ages 15 and 17 was associated with both symptoms of depression and social phobia, as we expected. The association was strongest in comorbid disorders and weakest in symptoms of social phobia without symptoms of depression. These findings are consistent with those of earlier studies on social phobia in adult populations [16,18] and with adolescent studies on depression [8,10]. To the best of our knowledge, however, there are no earlier studies comparing the strengths of the associations of self-esteem and social phobia, depression, or comorbid social phobia and depression among boys and girls.

As we expected based on earlier studies, boys had higher self-esteem than girls if they had no symptoms of either social phobia or depression [27]. This did not hold true, however, for those suffering from symptoms of depression without symptoms of social phobia at ages 15 or 17, comorbid symptoms of depression and symptoms of social phobia at age 15, and symptoms of social phobia without symptoms of depression at age 17. Thus, these disorders seemed to be more strongly associated with boys' self-esteem than girls'.

The role of low self-esteem in the emergence of social phobia and depression in middle adolescence seems to differ among boys and girls. Decrease in self-esteem was a perfect mediator for the association between symptoms of social phobia and subsequent symptoms of depression among boys, and a partial mediator for the association between symptoms of depression and later symptoms of social phobia among girls. Also, symptoms of social phobia and symptoms of depression in middle adolescence differentially affected self-esteem depending on sex. As we hypothesized, symptoms of social phobia at age 15 led to a decrease in self-esteem among boys but not among girls, and symptoms of depression at 15 led to a decrease in self-esteem among girls but not among boys. These sex differences in the associations might be explained by different attributions of self-esteem among boys and girls [8].

Symptoms of social phobia and symptoms of depression differentially affect self-esteem in girls and boys.

Girls may in general be more home-directed [45] and centered on one or two very good friends, while boys may orient more outward from home and be centered on larger peer groups [45]. Also, activity, action, and, for example, team sports and an active role in social situations might be more important toward building male self-esteem than female self-esteem [8]. Thus, symptoms of social phobia may have a greater effect on self-esteem among boys than girls. Depression is associated more directly with self-image, physical self-image [46], and perceived social acceptance, which could have a greater impact on self-esteem among girls than boys, leading to the deterioration of social functioning [19].

According to the results of the present study, among boys, symptoms of social phobia lead to deterioration of self-esteem, which in turn leads to subsequent symptoms of depression. This is especially likely as low self-esteem in the absence of symptoms of social phobia was not a risk factor for later symptoms of depression among boys. Among girls, this route is more complex. Symptoms of depression lead to deterioration of self-esteem among girls. Decreased self-esteem is a risk factor for symptoms of social phobia. Symptoms of depression and low self-esteem are also factors leading to symptoms of social phobia *per se*, or via other mediating factors among girls.

The present study was based on a large population sample. The coverage of compulsory comprehensive school until age 16 in Finland is greater than 99%. This cohort may thus be considered representative of the age group studied. The sample was also homogeneous regarding age. There are, however, some limitations to the current study that must be acknowledged for interpretation of our results. Firstly, while the response rate to the Adolescent Mental Health Cohort baseline survey was good, drop-out during the follow-up was relatively high, and was related to symptoms of depression at baseline. Although the baseline sample was large, the number of adolescents suffering from symptoms of depression and social phobia was quite low, and the non-significant findings in the difference in self-esteem between the different disorder groups may have been due to insufficient statistical power. This possible lack of statistical power, however, does not affect our main finding regarding the mediating effect of decrease in self-esteem. In addition, the lack of diagnostic interviews is a limitation. Adolescents are, however, able to reliably report their health in several psychological disorders [47], and the measures used in the present study were previously used successfully in large community samples of adolescents [12,30,35,38]. Further, the lack of control for other possible disorders may affect our main results. Externalizing symptoms were controlled for, however, which is rare in studies on depression and anxiety. Further, different methods used to obtain the information in

the follow-up may have affected the responses of the participants. For example, students who responded to measures at home or via the internet or postal services may be more or less likely to provide accurate results than those responding in supervised school settings.

Conclusions

Among boys, decrease in self-esteem mediates the association between earlier symptoms of social phobia and later symptoms of depression, and among girls it partially mediates the association between earlier symptoms of depression and later symptoms of social phobia. It is important to detect social phobia and depression among adolescents. This study emphasizes the importance of self-esteem as a central focus in treatment interventions for social phobia and depression among adolescents. Efficient intervention for the first disorder might help to prevent the decline in self-esteem and thus the incidence of the subsequent disorder. These findings are based on a sample of Finnish adolescents and should be confirmed in other jurisdictions or in more ethnically diverse samples.

Abbreviations

AMHC: Adolescent Mental Health Cohort; BDI-13: 13-item Beck Depression Inventory; CI: Confidence interval; DEP: Depression; K-SADS-PL: Schedules for affective disorders and schizophrenia for school-aged children –lifetime version; OR: Odds ratio; RSES: Rosenberg's Self Esteem Scale; SCAN: Schedules for clinical assessment in neuropsychiatry; SD: Standard deviation; SE: Self-esteem; SP: Social phobia; SPIN: Social Phobia Inventory; SPSS: Statistical package for the social sciences; T1: Time of the baseline survey; T2: Time of the 2-year follow-up survey; YSR: Youth Self Report.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

J-MV designed the study, performed the data and statistical analyses, interpreted the results, and wrote the manuscript. SF, MM, and RK-H designed the Adolescent Mental Health Cohort Study, organized the data collection of the Adolescent Mental Health Cohort Study, and participated in planning the design of the data analyses and in writing the manuscript. RI participated in planning the design of the data analyses and in writing the manuscript. MH participated in planning the design of the data analyses, interpreting the data, in planning and interpreting the statistical analyses, and in writing the manuscript. All authors read and approved the final manuscript.

Author details

¹Department of Adolescent Psychiatry, Tampere University Hospital, Box 2000, Tampere 33521, Finland. ²Tampere University Hospital, Tampere, Finland. ³Department of Adolescent Psychiatry, University of Tampere, Medical School, Tampere University Hospital, Tampere, Finland. ⁴School of Health Sciences, University of Tampere, Tampere, Finland. ⁵Science Center, Pirkanmaa Hospital District and School of Health Sciences, University of Tampere, Tampere, Finland. ⁶University of Helsinki, Helsinki, Finland. ⁷Department of Adolescent Psychiatry, Department of Mental Health and Substance Use Services, Helsinki University Central Hospital, National Institute for Health and Welfare, Helsinki, Finland.

Received: 29 April 2013 Accepted: 14 March 2014

Published: 19 March 2014

References

1. Kessler RC, Avenevoli S, Merikangas KR: Mood disorders in children and adolescents: an epidemiologic perspective. *Biol Psychiatry* 2001, **49**:1002–1014.

2. Lewinsohn PM, Rohde P, Seeley JR: **Major depressive disorder in older adolescents: prevalence, risk factors, and clinical implications.** *Clin Psychol Rev* 1998, **18**:765–794.
3. Ranta K, Kaltiala-Heino R, Rantanen P, Marttunen M: **Social phobia in Finnish general adolescent population: prevalence, comorbidity, individual and family correlates, and service use.** *Depress Anxiety* 2009, **26**:528–536.
4. Wittchen HU, Stein MB, Kessler RC: **Social fears and social phobia in a community sample of adolescents and young adults: prevalence, risk factors and co-morbidity.** *Psychol Med* 1999, **29**:309–323.
5. Beesdo K, Bittner A, Pine DS, Stein MB, Höfler M, Lieb R, Wittchen HU: **Incidence of social anxiety disorder and the consistent risk for secondary depression in the first three decades of life.** *Arch Gen Psychiatry* 2007, **64**:903–912.
6. Merikangas KR, Whitaker A, Angst J, Eaton W, Canino G, Rubio-Stipec M, Wacker H, Wittchen HU, Andrade L, Essau C, Kraemer H, Robins L, Kupfer D: **Comorbidity and boundaries of affective disorders with anxiety disorders and substance misuse: results of an international task force [comorbidity of mood disorders].** *Br J Psychiatry* 1996, **168**:58–67.
7. Angold A, Costello EJ, Erkanli A: **Comorbidity.** *J Child Psychol Psychiatry* 1999, **40**:57–87.
8. Rosenberg M: *Society And The Adolescent Self.* 1st edition. Princeton New Jersey: Princeton University Press; 1965.
9. Lewinsohn PM, Gotlib IH, Seeley JR: **Depression-related psychosocial variables: are they specific to depression in adolescents.** *J Abnorm Psychol* 1997, **106**:365–375.
10. Schmitz N, Kugler J, Rollnik J: **On the relation between neuroticism, self-esteem and depression: results from the national comorbidity study.** *Compr Psychiatry* 2003, **44**:169–176.
11. Orth U, Robins RW, Roberts BW: **Low self-esteem prospectively predicts depression in adolescence and young adulthood.** *J Pers Soc Psychol* 2008, **95**:695–708.
12. Pelkonen M, Marttunen M, Aro H: **Risk for depression: a 6-year follow-up of Finnish adolescents.** *J Affect Disord* 2003, **77**:41–45.
13. Costello DM, Swendsen J, Rose JS, Dierker LC: **Risk and protective factors associated with trajectories of depressed mood from adolescence to early adulthood.** *J Consult Clin Psychol* 2008, **76**:173–183.
14. Van Voorhees BW, Paunescu D, Sachico A, Kuwabara SA, Basu A, Gollan J, Hankin BL, Melkonian S, Reinecke M: **Protective and vulnerability factors predicting new-onset depressive episode in a representative of U.S. adolescents.** *J Adolesc Health* 2008, **42**:605–61.
15. Alfano CA, Beidel DC, Turner SM: **Negative self-imagery among adolescents with social phobia: a test of an adult model of the disorder.** *J Clin Child Adolesc Psychol* 2008, **37**:327–336.
16. Izjic F, Akyuz G, Dogan O, Kugu N: **Social phobia among university students and its relation to self-esteem and body image.** *Can J Psychiatry* 2004, **49**:630–634.
17. Rosenberg M, Schooler C, Schoenbach C, Rosenberg F: **Global self-esteem and specific self-esteem: different concepts, different outcomes.** *Am Soc Rev* 1995, **60**:141–156.
18. Acarturc C, Smit F, de Graaf R, van Straten A, ten Have M, Cuijpers P: **Incidence of social phobia and identification of its risk indicators: a model for prevention.** *Acta Psychiatr Scand* 2009, **119**:62–70.
19. Eberhart NK, Shih JH, Hammen CL, Brennan PA: **Understanding the sex difference in vulnerability to adolescent depression: an examination of child and parent characteristics.** *J Abnorm Child Psychol* 2006, **34**:495–508.
20. Hankin BL: **Development of sex differences in depressive and co-occurring anxious symptoms during adolescence: descriptive trajectories and potential explanations in a multiwave prospective study.** *J Clin Child Adolesc Psychol* 2009, **38**:460–472.
21. Gotlib IH, Lewinsohn PM, Seeley JR: **Consequences of depression during adolescence: marital status and marital functioning in early adulthood.** *J Abnorm Psychol* 1998, **107**:686–690.
22. Lewinsohn PM, Rohde P, Seeley JR, Klein DN, Gotlib IH: **Natural course of adolescent major depressive disorder in a community sample: predictors of recurrence in young adults.** *Am J Psychiatry* 2000, **157**:1584–1591.
23. Dell'osso L, Saettoni M, Papasogli A, Rucci PD, Ciapparelli AM, Di Poggio AB, Ducci F, Hardoy C, Cassano GB: **Social anxiety spectrum: gender differences in Italian high school students.** *J Nerv Ment Dis* 2002, **190**:225–232.
24. Gren-Landell M, Tillfors M, Furmark T, Bohlin G, Andersson G, Svedin CG: **Social phobia in Swedish adolescents, prevalence and gender differences.** *Soc Psychiatry Psychiatr Epidemiol* 2009, **44**:1–7.
25. Väänänen J, Fröjd S, Ranta K, Marttunen M, Helminen M, Kaltiala-Heino R: **Relationship between social phobia and depression differs between boys and girls in mid-adolescence.** *J Affect Disord* 2011, **133**:97–104.
26. Algood-Merten B, Lewinsohn PM, Hops H: **Sex differences and adolescent depression.** *J Abnorm Psychol* 1990, **99**:55–63.
27. Raevuori A, Dick DM, Keski-Rahkonen A, Pulkkinen L, Rose RJ, Rissanen A, Kaprio J, Viken RJ, Silventoinen K: **Genetic and environmental factors affecting self-esteem from age 14 to 17: a longitudinal study of Finnish twins.** *Psychol Med* 2007, **37**:1625–1633.
28. Fröjd S, Marttunen M, Pelkonen M, von der Pahlen B, Kaltiala-Heino R: **Perceived financial difficulties and maladjustment outcomes in adolescence.** *Eur J Public Health* 2006, **16**:542–548.
29. Fröjd S, Marttunen M, Pelkonen M, von der Pahlen B, Kaltiala-Heino R: **Adult and peer involvement in help-seeking for depression in adolescent population. A two-year follow-up in Finland.** *Soc Psychiatry Psychiatr Epidemiol* 2007, **42**:945–952.
30. Raitasalo R, Mielialakysely: *Suomen Oloihin Beckin Lyhyen Depressiokyselym Pohjalta Kehitetty Masennusoireilun Ja Itsetunnon Kysely.* Helsinki: Kela, Sosiaal- Ja Terveysturvan Tutkimuksia 86, [Mood Questionnaire. Finnish Modification Of The Short Form Of The Beck Depression Inventory Measuring Depression Symptoms And Self-Esteem. Abstract In English]. Helsinki: The Social Insurance Institution; 2007.
31. Beck A, Beck R: **Screening depressed patients in family practice. A rapid technic.** *Postgrad Med* 1972, **52**:81–85.
32. Beck A, Rial W, Rickels K: **Short form of depression inventory: cross-validation.** *Psychol Rep* 1974, **34**:1184–1186.
33. Bennett DS, Ambrosini PJ, Bianchi M, Barnett D, Metz C, Rabinovich H: **Relationship of Beck depression inventory factors to depression among adolescents.** *J Affect Disord* 1997, **45**:127–134.
34. Fountoulakis KN, Iacovides A, Kleanthou S, Samolis S, Gougoulakis K, St Kaprinis G, Bech P: **The Greek translation of the symptoms rating scale for depression and anxiety: preliminary results of the validation study.** *BMC Psychiatry* 2003, **3**:1–8.
35. Kaltiala-Heino R, Rimpelä M, Rantanen P, Laipala P: **Finnish modification of the 13-item beck depression inventory in screening an adolescent population for depressiveness and positive mood.** *Nord J Psychiatry* 1999, **53**:451–457.
36. Connor KM, Davidson JRT, Churchill LE, Sherwood A, Foa E, Weisler RH: **Psychometric properties of the Social Phobia Inventory (SPIN): new self rating scale.** *Br J Psychiatry* 2000, **76**:379–386.
37. Johnson HS, Inderbitzen-Nolan H, Anderson ER: **The Social Phobia Inventory: validity and reliability in an adolescent community sample.** *Psychol Asses* 2006, **18**:269–277.
38. Ranta K, Kaltiala-Heino R, Rantanen P, Tuomisto MT, Marttunen M: **Screening social phobia in adolescents from general population: the validity of the social phobia inventory (SPIN) against a clinical interview.** *Eur Psychiatry* 2007, **22**:244–251.
39. Achenbach TM: *Manual for The Child Behavior Checklist/4-18 And 1991 Profile.* Burlington, VT: University of Vermont Department of Psychiatry; 1991.
40. DeWit DJ, Chandler-Coutts M, Offord DR, King G, McDougall J, Specht J, Stewart S: **Gender differences in the effects of family adversity on the risk of onset of DSM-3-R social phobia.** *J Anxiety Disord* 2005, **19**:479–502.
41. Wittchen HU, Fehm L: **Epidemiology, patterns of comorbidity, and associated disabilities of social phobia.** *Psychiatr Clin North Am* 2001, **24**:617–641.
42. Baron RM, Kenny DA: **The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations.** *J Pers Soc Psychol* 1986, **51**:1173–1182.
43. Leary MR, Haupt AL, Strausser KS, Chokel JT: **Calibrating the sociometer: the relationship between interpersonal appraisals and state self-esteem.** *J Pers Soc Psychol* 1998, **74**:1290–1299.
44. Dumont M, Provost MA: **Resilience in adolescents: protective role of social support, coping strategies, self-esteem, and social activities on experience of stress and depression.** *J Youth Adolesc* 1999, **28**:343–363.
45. Facio A, Batistuta M: **What makes argentinian girls unhappy? A cross-cultural contribution to understanding gender differences in depressed mood during adolescence.** *J Adolesc* 2001, **24**:671–680.
46. Hankin BL, Abramson LY: **Development of gender differences in depression: description and possible explanations.** *Ann Med* 1999, **31**:372–379.
47. Smith BH, Pelham WE, Gnagy E, Molina B, Evans S: **The reliability, validity, and unique contributions of self-report by adolescents receiving treatment for attention-deficit/hyperactivity disorder.** *J Consult Clin Psychol* 2000, **68**:489–499.

doi:10.1186/1471-244X-14-79

Cite this article as: Väänänen et al.: Decrease in self-esteem mediates the association between symptoms of social phobia and depression in middle adolescence in a sex-specific manner: a 2-year follow-up of a prospective population cohort study. *BMC Psychiatry* 2014 **14**:79.

Low perceived social support predicts later depression but not social phobia in middle adolescence

Juha-Matti Väänänen^{a*}, Mauri Marttunen^{b,c,d}, Mika Helminen^{e,f} and Riittakerttu Kaltiala-Heino^{g,a}

^aDepartment of Adolescent Psychiatry, Tampere University Hospital, Tampere, Finland; ^bDepartment of Psychiatry, University of Helsinki, Helsinki, Finland; ^cDepartment of Adolescent Psychiatry, Helsinki University Central Hospital, Helsinki, Finland; ^dDepartment of Mental Health and Substance Use Services, National Institute for Health and Welfare, Helsinki, Finland; ^eScience Center, Pirkanmaa Hospital District, Tampere, Finland; ^fTampere School of Public Health, University of Tampere, Tampere, Finland; ^gMedical School, University of Tampere, Tampere, Finland

(Received 20 November 2013; accepted 4 September 2014)

Social phobia and depression are common and highly comorbid disorders in adolescence. There is a lack of studies on possible psychosocial shared risk factors for these disorders. The current study examined if low social support is a shared risk factor for both disorders among adolescent girls and boys. This study is a part of the Adolescent Mental Health Cohort Study's two-year follow-up. We studied cross-sectional and longitudinal associations of perceived social support with social phobia, depression, and comorbid social phobia and depression among girls and boys. The study sample consisted of 2070 15-year-old adolescents at baseline. Depression was measured by the 13-item Beck Depression Inventory, social phobia by the Social Phobia Inventory (SPIN), and perceived social support by the Perceived Social Support Scale-Revised (PSSS-R). Girls reported higher scores on the PSSS-R than boys in total scores and in friend and significant other subscales. Cross-sectional PSSS-R scores were lower among adolescents with social phobia, depression, and comorbid disorder than among those without these disorders. Low PSSS-R total score and significant other subscale were risk factors for depression among both genders, and low support from friends among girls only. Low perceived social support from any source was not a risk factor for social phobia or comorbid social phobia and depression. As conclusion of the study, low perceived social support was a risk factor for depression, but not a shared risk factor for depression and social phobia. Interventions enhancing perceived social support should be an important issue in treatment of depression.

Keywords: social anxiety; phobia; depression; social support; adolescents; gender differences; family support; peer support

Introduction

Social phobia and depression are common disorders among adolescents. The point prevalence estimates of social phobia in adolescence range from 1.6% to 6%, and lifetime prevalence estimates from 7% to 14% (Essau, Conradt, & Petermann, 1999; Gren-Landell et al., 2009; Ranta, Kaltiala-Heino, Rantanen, & Marttunen, 2009; Shields, 2004; Väänänen et al., 2011; Wittchen, Stein, & Kessler, 1999). Prevalence estimates of depression in adolescence range from 3% to

*Corresponding author. Email: juha.vaananen@pshp.fi

10% (Kessler, Avenevoli, & Merikangas, 2001; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Lewinsohn, Rohde, & Seeley, 1998; Roberts, Lewinsohn, & Seeley, 1995) and from 15% to 25% (Kessler & Walters, 1998; Lewinsohn et al., 1993), respectively. Comorbidity between social phobia and depression is common, and these two disorders have been a focus for quite many comorbidity studies (Beesdo et al., 2007; Bittner, Goodwin, & Wittchen, 2004; Lewinsohn, Zinbarg, Seeley, Lewinsohn, & Sack, 1997; Väänänen et al., 2011; Wittchen et al., 1999).

Based on several studies on the comorbidity of social phobia and depression, it has been hypothesized that social phobia may cause psychological and functional deterioration leading to depression (Kessler, Stang, Wittchen, Stein, & Walters, 1999; Merikangas et al., 1996) or there may be shared risk factors for both disorders leading to different phenotypes, which may vary over time (Angold, Costello, Farmer, Burns, & Erkanli, 1999). Among adolescents who suffer from social phobia, risk factors for subsequent depression have been found to be a number of feared situations, and pervasiveness, severity, and earlier onset of social phobia (Beesdo et al., 2007; Bittner et al., 2004; Chavira, Stein, Bailey, & Stein, 2004).

Low social support has been reported as a risk factor for adolescent psychiatric problems (Aseltine, Gore, & Colten, 1994; Ezzell, Swenson, & Brondino, 2000; Ritakallio, Luukkala, Marttunen, Pelkonen, & Kaltiala-Heino, 2010; Sheeber, Hops, Alpert, Davis, & Andrews, 1997). Blumenthal et al. (1987) reported in their original study using Perceived Social Support Scale (PSSS) that among adults probability to coronary artery disease was inversely related to the level of social support and that social support moderated the long-term health consequences for type A behavioural pattern (Blumenthal et al., 1987). Parental support has found to be a predictor of identity achievement in adolescent development (Sartor & Youniss, 2002). The interaction with social network may directly produce positive or negative psychological states being supportive or depriving (Kawachi & Bergman, 2001).

Low social support has shown to be associated with adolescent depression in many studies (Bettge et al., 2008; Kaltiala-Heino, Rimpelä, Rantanen, & Laippala, 2001; Lewinsohn, Gotlib, & Seeley, 1997; Newman, Newman, Griffen, O'Connor, & Spas, 2007; Schraedley, Gotlib, & Hayward, 1999) and high social support has been found to have a buffering effect against the emergence of adolescent depression (Denny, Clark, Fleming, & Wall, 2004; Piko, Kovacs, & Fitzpatrick, 2009). Studies concerning the association between social support and social phobia are much less common. Theoretically, low perceived social support may lead an adolescent to insecurity in social situation and, thus, to social phobia. Perceiving high social support from family and low social support from friends may also lead an adolescent to turn more to home from social situations possibly leading to social phobia. Adolescents with social anxiety have shown to experience lower support from friends and classmates in a study about perceived support from friends, classmates, and family (La Greca & Lopez, 1998), and less support from friends in a study about perceived support from mother, father, and friends (McDonald, Bowker, Rubin, Laursen, & Duchene, 2010).

During adolescent development adolescents turn to seek support from peers instead of their family. In childhood, families are the strongest source of support followed by peers and teachers (Ezzell et al., 2000). Among children in prospective study from 1st grade to 10th grade, most common support provider was biological father followed by grandparents (Appleyard, England, & Sroufe, 2007). During adolescence, the perception of source of support has reported to turn from family to peers (Garnefski, 2000).

The sources of social support have been found to have different impacts on risk for social phobia and depression. Both low family and low peer support have been linked to depression in middle and late adolescence in most studies (Denny et al., 2004; Lewinsohn, Gotlib, et al., 1997; McDonald et al., 2010), while school-related support has played only a modest role in relation to depression (Piko et al., 2009). High social support from friends but not from family

or teachers has been found to protect against social phobia (La Greca & Lopez, 1998; McDonald et al., 2010).

Previous research has reported gender differences in social phobia, depression, and social support. In epidemiological studies, the prevalence of social phobia has found to be higher among girls than boys (Gren-Landell et al., 2009; Shields, 2004; Wittchen et al., 1999). The prevalence of depression is higher among girls from adolescence onwards, and risk factors for depression differ by gender. Conflicts with family, negative cognitive style, and rumination have been found to be risk factors among females only (Hankin, 2009; Hankin & Abramson, 2001; Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2000). Females have a higher risk for recurrence of depression (Lewinsohn et al., 2000). Among females with earlier social phobia the onset of subsequent comorbid depression takes place in a shorter interval than among males (Beesdo et al., 2007). Females report higher levels of perceived social support than males (Bettge et al., 2008), especially received from outside the family (Katainen, Räikkönen, & Keltinkangas-Järvinen, 1999; La Greca & Lopez, 1998). Stress and social support have been more strongly associated with depression among girls than boys in some studies (Bettge et al., 2008; Kalliala-Heino et al., 2001), but not in all (Denny et al., 2004). Low social support has been shown to have a more deleterious effect on social functioning among girls than among boys (La Greca & Lopez, 1998).

Social phobia and depression are highly comorbid with each other, but there is a lack of prospective population-based studies among adolescents about possible psychosocial shared risk factors for these disorders. To better understand the development of social phobia and depression and thus to improve preventive interventions and treatment for these under-recognized and under-treated disorders (Kessler et al., 2001; Lewinsohn et al., 1998; Shields, 2004; Wittchen et al., 1999), prospective population studies on the psychosocial risk factors for these disorders and their comorbidity are needed. Further, more research on gender-specific patterns of risk factors is needed to develop earlier and more precise identification of social phobia, depression, and comorbid social phobia and depression, and to develop specific interventions of these disorders for girls and boys. The aims of our study were (1) to explore if low perceived social support from different sources is a risk factor for social phobia, depression, and comorbid social phobia and depression in two-year follow-up separately among boys and girls; (2) to identify cross-sectional associations between depression and social phobia and perceived social support among girls and boys aged 15 and 17 years; and (3) to analyse gender differences in perceived social support, and its associations with social phobia and depression in middle adolescence.

Based on previous literature we expected that (1) low perceived social support – particularly from peers – is a risk factor for both depression and social phobia; (2) low perceived social support from family is an additional risk factor for depression; (3) low perceived social support is associated with current social phobia and depression, being most evident among those with comorbid disorders; and (4) the above mentioned effects are more prominent among girls than boys.

Materials and methods

Study samples and procedures

This study is part of an ongoing prospective cohort study, the Adolescent Mental Health Cohort (AMHC) Study, conducted in two Finnish cities, Tampere (200,000 inhabitants) and Vantaa (180,000 inhabitants). These cities were chosen because they represent well Finnish urban population. Tampere is the largest provincial centre outside the capital city area, and Vantaa is about the same sized site in the capital city area of Finland. Data collection, procedures, and measures of the

study have been reported in detail elsewhere (Fröjd, Marttunen, Pelkonen, von der Pahlen, & Kaltiala-Heino, 2006, 2007). Briefly, at baseline survey 2002–2003 (T1), data were collected from all ninth graders (age 15) in all Finnish-speaking secondary schools in the two cities. Subjects completed a person-identifiable survey during a school lesson under the supervision of a teacher. Another opportunity to participate was offered in the school within a couple of weeks for students absent from school on the original survey day. For students not present on either occasion the questionnaires were sent by post twice, and if no reply was received, it was concluded that the student was not willing to participate. Thus, the participation rate for T1 data collection was excellent (94.4%), consisting 3278 adolescents (mean age = 15.5 years, SD = 0.39; 1609 girls, 1669 boys, 69% living in two-parent families). Follow-up data collection was conducted in 2004–2005 (T2). Eligible participants at T2 were students who had participated at T1. We organized school-based surveys as T1 in upper secondary schools and vocational schools. Surveys were sent by post to adolescents not reached through schools and to those who did not respond even by post, the same survey was offered by Internet (Fröjd et al., 2006).

A total of 2070 adolescents completed the survey at both T1 and T2. The response rate of the final sample was 63.1% (2070/3278). Of the respondents 56.6% were girls. The mean age at T2 was 17.6 years (SD 0.4). At T2 over 80% of the adolescents were full-time students (girls 89.6%, boys 82.0%, $p < .001$). Cases were excluded if more than three items of our measures were unanswered. If only three or less items were unanswered, missing values were replaced with the mean value of the subject's responses to the other items of the scale. Because of too many unanswered items, 32 subjects were excluded from the analyses, and the final sample consisted of 2038 subjects, 1154 girls and 884 boys. In the analyses, we always used all data available on the issues of interest, and therefore, the number of subjects varies slightly between separate analyses.

Measures

Depression (DEP). A Finnish modification of the 13-item Beck Depression Inventory (R-BDI) (Raitasalo, 2007) was used to assess depression (Beck & Beck, 1972; Beck, Rial, & Rickels, 1974). The R-BDI is a widely used self-report scale measuring the severity of depressive symptoms, and its reliability and validity are good (Bennet et al., 1997). The R-BDI has been shown to be appropriate for measuring depression in Finnish adolescents in population studies (Kaltiala-Heino, Rimpelä, Rantanen, & Laippala, 1999; Raitasalo, 2007). Each item is scored 0–3 according to the severity of the symptom. Sum scores of 13 items (range 0–39) were dichotomized to non/mild depression (scores 0–7), and moderate/severe depression (scores 8–39) (Beck & Beck, 1972). A cut-off score of 8 predicts a diagnosis of depression by structured interview Schedules for Clinical Assessment in Neuropsychiatry with good sensitivity (0.93) and specificity (0.88) (Fountoulakis et al., 2003).

Social phobia (SP). To measure social phobia we used the Social Phobia Inventory (SPIN) (Connor et al., 2000). SPIN is a 17-item self-report questionnaire for measuring symptoms of social phobia. It is constructed on a five-point Likert-type scale which has previously shown good reliability and construct validity (Johnson, Inderbitzen-Nolan, & Anderson, 2006; Ranta, Kaltiala-Heino, Rantanen, Tuomisto, & Marttunen, 2007) for use among English-speaking and Finnish adolescents. For the Finnish translation of SPIN, a cut-off of 24 points has resulted in 81.8% sensitivity and 85.1% specificity in relation to a diagnosis of social phobia based on the Schedules for Affective Disorders and Schizophrenia for school-aged children – Present and Lifetime version (Kiddie-SADS-PL) diagnostic interview (Ranta et al., 2007).

Social support. The Perceived Social Support Scale-Revised (PSSS-R) was used to measure perceived social support from multiple sources. The PSSS-R was first presented by Blumenthal et al. (1987) in their study on the impact of social support to moderate the association between

behaviour type and coronary artery disease. The PSSS-R measures people's subjective perceptions of social support and emotional closeness (Blumenthal et al., 1987). It contains 12 items on a 5-point Likert-type scale. Factor-analytically derived sum scores were used for addressing perceived support from family, friends, and significant others (each ranging 4–20). High sum scores indicate high perceived social support. PSSS-R sum scores were used as a continuous variable. The PSSS-R has been shown to be a useful method for assessing perceived social support among Finnish adolescents (Katainen et al., 1999). Reliabilities for the subscales were for girls and boys, respectively, $\alpha = 0.91$ and $\alpha = 0.82$ for family support; $\alpha = 0.93$ and $\alpha = 0.91$ for significant other support; and $\alpha = 0.89$ and $\alpha = 0.84$ for support from friends (Fröjd et al., 2006).

Covariates

In the statistical analyses, the controlled covariates were age (calculated from the date of survey and date of birth), family structure (asked to select from items in questionnaire on question 'do your family include?': mother and father; mother and stepfather; father and step mother; only mother; only father; someone else caretaker; who. For present study we dichotomized the answers to living with both biological parents, if the first item was selected/living in some other family structure, if some of the other items was selected), both parents' highest educational qualification (asked to select from items in questionnaire on question: what is the highest educational level your father has completed/'what is the highest educational level your mother has completed?' Items to select were comprehensive school only, comprehensive school and vocational school, college and vocational school, and university examine. For the present study we dichotomized the answers to comprehensive school only, if the first item was selected/higher education, if some of the other items were selected), and externalizing symptoms, measured by Finnish version of the Youth Self Report (YSR) (Achenbach, 1991), at T1. We used externalizing scale of YSR as continuous sum scores. These covariates were chosen since previous studies have suggested that they have an impact on the main variables of interest in the present study (Costello, Swendsen, Rose, & Dierker, 2008; DeWit et al., 2005; Hankin, 2009; Hankin & Abramson, 2001; Kendler, Gardner, & Prescott, 2002, 2006; Wittchen & Fehm, 2001).

Attrition

Compared to responders at both surveys, there were more boys (63.4% vs. girls 36.6%; $p < .001$) and subjects with depression at T1 (11.7% (dropouts) vs. 9.1% (responders), $p = .020$) among dropouts. There were no differences in response rate at T2 among those with or without social phobia at T1 (65.1% vs. 63.1%, $p = .523$). Dropout boys' perceived support from family at T1 was significantly lower than that perceived by boys also responding at T2 (Mann–Whitney test, $p = .015$). Social support from family among girls, and social support from friends and from significant other among both genders did not differ significantly between responders and dropouts. Father's or mother's highest educational status was more often comprehensive school only or lower among dropouts at T2 (father 18.9% vs. 15.1, $p = .005\%$; mother 16.1% vs. 12.2%, $p = .002$).

Statistical analysis

We formed four groups of our sample according to disorder status: adolescents without social phobia or depression (no SP/DEP) (SPIN score < 24 , R-BDI score < 8), with social phobia and without depression (SP) (SPIN ≥ 24 , R-BDI < 8), with depression and without social phobia

(DEP) (SPIN < 24, R-BDI \geq 8), and with both social phobia and depression (comorbid SP/DEP) (SPIN \geq 24, R-BDI \geq 8).

To explore current social support according to disorder status, because the distribution of scores of the PSSS-R was non-Gaussian, the Kruskal–Wallis test at a significance level of $p = .05$ was used. To analyse one-to-one differences between disorder groups, we used the Bonferroni-corrected Mann–Whitney test. Because we had 4 groups, we had 6 paired comparisons, meaning that statistical significance of p -level $0.05/6 = 0.008333$ was used.

The statistical significance of gender differences was tested by the Mann–Whitney test at $p = .05$ level. We used medians instead of means as the parameter, because of the non-Gaussian distribution of PSSS-R scores.

In analyses of longitudinal associations between social support at T1 and disorder status at T2, we selected the sub-samples free of both disorders at T1 to control the possible confounding effect of baseline SP and DEP to the results. For analyses we used the Kruskal–Wallis test. To control for the effects of covariates – age, family structure, both parents' highest educational qualification, and external symptoms – we used binomial logistic regression analysis.

Statistical significance was tested two-tailed.

Data analyses were made using SPSS, version 16.0 (SPSS Inc., Chicago, Illinois, USA).

Results

Cross-sectional associations between current SP, DEP, or comorbid SP/DEP and perceived social support at age 15 and 17 years

In the Kruskal–Wallis test, low scores of all subscales of PSSS-R, family, friends, and significant others, as well as total scores on the PSSS-R were associated with having DEP, SP, or comorbid SP/DEP at both T1 and T2 among both genders ($p < .001$) (Tables 1 and 2).

In the Bonferroni-corrected Mann–Whitney test among girls at ages 15 and 17 years, perceived social support scores, both total score and all subscale scores, were highest in the no SP/DEP group, and lowest in the comorbid SP/DEP group. Perceived social support from family at both T1 and T2 surveys, and total score and significant other subscale of the PSSS-R at T2 were lower in the DEP group than in the SP group (Tables 1 and 2).

Similarly, in the Bonferroni-corrected Mann–Whitney test among boys at both ages, perceived social support was highest in the no SP/DEP group and lowest in the comorbid SP/DEP group. Among boys perceived support from family was lower in the DEP group than in the SP group at T1 and T2, but perceived social support from significant other at T2 was lower in the SP group than in the DEP group (Tables 1 and 2).

Longitudinal associations between perceived social support at age 15 years and incidence of SP, DEP, or comorbid SP/DEP during follow-up

In analyses made by the Kruskal–Wallis test among adolescents in no SP/DEP group at T1, low perceived social support at T1 predicted DEP at T2 but not SP or comorbid SP/DEP at T2. Among girls a statistically significant association was found between low total score ($p = .004$), family subscale ($p = .008$), and friend subscale ($p = .008$) of PSSS-R and subsequent DEP. Among boys the same association was found between low total score ($p = .005$), family subscale ($p = .008$), and significant other subscale ($p = .001$) and subsequent DEP.

In logistic regression after controlling for covariates (age, family structure, both parents' highest educational qualification, and external symptoms), low total score of PSSS-R (odds ratio (OR) = 0.944, 95% confidence interval (C.I.) 0.906–0.984, $p = .006$), low perceived

Table 1. Current PSSS-R scores according to disorders at age 15 years among girls and boys.

		Girls				Boys				<i>p</i> of gender difference
		(1) No SP/ DEP <i>n</i> = 945	(2) SP <i>n</i> = 56	(3) DEP <i>n</i> = 73	(4) Comorbid SP/DEP <i>n</i> = 60	(1) No SP/ DEP <i>n</i> = 759	(2) SP <i>n</i> = 49	(3) DEP <i>n</i> = 35	(4) Comorbid SP/DEP <i>n</i> = 18	
PSSS-R scores	Total score	<i>M</i> = 55.00 SD = 7.00	<i>M</i> = 53.00 SD = 8.70*	<i>M</i> = 47.00 SD = 10.04**	<i>M</i> = 42.23 SD = 11.81**,+ [□]	<i>M</i> = 48.00 SD = 10.72	<i>M</i> = 41.00 SD = 11.90**	<i>M</i> = 40.00 SD = 14.45**	<i>M</i> = 25.00 SD = 12.18**,+ ⁺	(1) <.001 (2) <.001 (3) =.002 (4) <.001
	Family subscale	<i>M</i> = 18.00 SD = 3.29	<i>M</i> = 16.50 SD = 3.91	<i>M</i> = 13.00 SD = 4.60**,+ ⁺	<i>M</i> = 12.50 SD = 4.65**,+ ⁺	<i>M</i> = 18.00 SD = 3.57	<i>M</i> = 16.00 SD = 4.14*	<i>M</i> = 12.00 SD = 5.03**,+ ⁺	<i>M</i> = 11.36 SD = 5.18**,+ ⁺	(1) n.s. (2) n.s. (3) n.s. (4) n.s.
	Friend subscale	<i>M</i> = 19.00 SD = 2.95	<i>M</i> = 18.00 SD = 3.37*	<i>M</i> = 17.00 SD = 4.27	<i>M</i> = 14.05 SD = 4.86**,+ ^{□□}	<i>M</i> = 16.00 SD = 4.17	<i>M</i> = 13.00 SD = 4.62*	<i>M</i> = 13.00 SD = 5.76**	<i>M</i> = 7.50 SD = 4.65**,+ ⁺	(1) <.001 (2) <.001 (3) =.001 (4) =.001
	Significant other subscale	<i>M</i> = 20.00 SD = 2.70	<i>M</i> = 18.50 SD = 3.48*	<i>M</i> = 19.00 SD = 4.50	<i>M</i> = 16.00 SD = 4.96**,+ ^{□□}	<i>M</i> = 16.00 SD = 4.48	<i>M</i> = 13.00 SD = 4.74*	<i>M</i> = 10.64 SD = 6.22	<i>M</i> = 6.50 SD = 4.31**,+ ⁺	(1) <.001 (2) <.001 (3) <.001 (4) <.001

Note: SP = Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP = depression (SPIN < 24 , R-BDI ≥ 8), and comorbid SP/DEP (SPIN ≥ 24 , R-BDI ≥ 8). *M* = median, SD = standard deviation. Statistical significance by the Bonferroni-corrected Mann-Whitney test: disorder groups vs. no SP/DEP group: ***p* < .001, **p* < .00833; DEP or comorbid SP/DEP groups vs. SP group: +*p* < .001, +*p* < .00833; comorbid SP/DEP group vs. DEP group: □*p* < .001, □*p* < .00833. *p* of gender difference: (1), in no SP/DEP; (2), in SP; (3), in DEP; and (4), in comorbid SP/DEP groups.

Table 2. Current PSSS-R scores according to disorders at age 17 years among girls and boys.

		Girls				Boys				<i>p</i> of gender difference
		(1) No SP/ DEP <i>n</i> = 940	(2) SP <i>n</i> = 79	(3) DEP <i>n</i> = 57	(4) Comorbid SP/DEP <i>n</i> = 62	(1) No SP/ DEP <i>n</i> = 755	(2) SP <i>n</i> = 48	(3) DEP <i>n</i> = 22	(4) Comorbid SP/DEP <i>n</i> = 34	
PSSS-R scores	Total score	<i>M</i> = 57.00 SD = 6.61	<i>M</i> = 52.00 SD = 7.85**	<i>M</i> = 42.00 SD = 11.74**,+ ⁺	<i>M</i> = 44.50 SD = 10.61**,+ ⁺	<i>M</i> = 51.00 SD = 9.51	<i>M</i> = 46.00 SD = 8.01*	<i>M</i> = 43.50 SD = 11.94*	<i>M</i> = 37.00 SD = 12.90**,+ ⁺	(1) <0.001 (2) = 0.006 (3) n.s. (4) = 0.001
	Family subscale	<i>M</i> = 18.00 SD = 3.42	<i>M</i> = 16.00 SD = 3.07**	<i>M</i> = 12.00 SD = 4.97**,+ ⁺	<i>M</i> = 14.00 SD = 3.98**,+ ⁺	<i>M</i> = 18.00 SD = 3.53	<i>M</i> = 17.00 SD = 2.85	<i>M</i> = 12.50 SD = 5.31**,+ ⁺	<i>M</i> = 12.00 SD = 4.59**,+ ⁺	(1) = 0.015 (2) = 0.036 (3) n.s. (4) n.s.
	Friend subscale	<i>M</i> = 20.00 SD = 2.74	<i>M</i> = 17.00 SD = 3.53**	<i>M</i> = 15.00 SD = 5.12**	<i>M</i> = 15.00 SD = 4.72**,+ ⁺	<i>M</i> = 17.00 SD = 3.72	<i>M</i> = 15.00 SD = 3.47**	<i>M</i> = 16.00 SD = 4.22**	<i>M</i> = 12.00 SD = 5.41**	(1) <0.001 (2) = 0.001 (3) n.s. (4) = 0.014
	Significant other subscale	<i>M</i> = 20.00 SD = 2.30	<i>M</i> = 19.00 SD = 3.23*	<i>M</i> = 16.00 SD = 4.60**,+ ⁺	<i>M</i> = 17.00 SD = 4.35**,+ ⁺	<i>M</i> = 18.00 SD = 3.90	<i>M</i> = 15.50 SD = 3.80*	<i>M</i> = 17.50 SD = 5.33**,+ ⁺	<i>M</i> = 12.00 SD = 5.39**,+ ⁺ , [□]	(1) <0.001 (2) <0.001 (3) n.s. (4) <0.001

Note: SP = Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP = depression (SPIN < 24, R-BDI ≥ 8), and comorbid SP/DEP (SPIN ≥ 24 , R-BDI ≥ 8). *M* = median, SD = standard deviation. Statistical significance by the Bonferroni-corrected Mann-Whitney test: disorder groups vs. no SP/DEP group: ** = $p < .001$, * = $p < .00833$; DEP or comorbid SP/DEP groups vs. SP group: +⁺ $p < .001$, +⁺ $p < .00833$; Comorbid SP/DEP group vs. DEP group: ^{□□} $p < .001$, ^{□□} $p < .00833$. *p* of gender difference: (1), in no SP/DEP; (2), in SP; (3), in DEP; and (4), in comorbid SP/DEP groups.

support from friends (OR = 0.897, 95% C.I. 0.837–0.990, $p = .031$), and from significant other (OR = 0.871, 95% C.I. 0.786–0.975, $p = .009$) at T1 predicted DEP at T2 among girls. Among boys low PSSS-R total score (OR = 0.959, 95% C.I. 0.921–0.999, $p = .046$) and low support from significant other (OR = 0.882, 95% C.I. 0.798–0.975, $p = .014$) predicted DEP at T2. Low perceived support from the family did not predict DEP among either gender. As in analyses made by the Kruskal–Wallis test, in logistic regression with covariates total score of PSSS-R, or scores of any of the subscales of the PSSS-R at T1 did not predict SP or comorbid SP/DEP at T2 among either gender (Tables 3 and 4).

Gender differences in perceived social support and its associations to SP, DEP, and comorbid SP and DEP

Analysed by the Mann–Whitney test in the total sample, girls reported significantly higher perceived support in all PSSS-R subscales except family subscale ($p < .001$ each) in both surveys. In the different disorder groups, girls reported higher perceived social support in all subscales, except family subscale at T1. At T2 in the DEP group there were no gender differences in PSSS-R total score or in any subscales of PSSS-R. Boys presented higher support from family in no SP/DEP and SP groups. There were no gender differences in family subscale in DEP or comorbid SP/DEP groups. Otherwise girls reported higher perceived support (Tables 1 and 2). Low perceived social support from friends at T1 predicted DEP at T2 only among girls (Tables 3 and 4).

Discussion

Our main aim was to study low perceived social support as a risk factor for subsequent social phobia, depression, and comorbid social phobia and depression. Our hypothesis was supported only partly, because low perceived social support was predictive only for subsequent depression but not for social phobia or comorbid social phobia and depression.

Table 3. Perceived social support at age 15 years and risk for disorders at age 17 years among girls without social phobia or depression at T1.

			Disorder status at age 17 years <i>n</i> = disorder/no disorder		
			SP <i>n</i> = 41/851	DEP <i>n</i> = 30/851	Comorbid SP/DEP <i>n</i> = 22/851
Girls' perceived social support at age 15 years	Total score	OR	0.986	0.944	0.964
		<i>p</i>	.103	.006	.143
		95% C.I.	0.954–1.018	0.906–0.984	0.918–1.012
	Family subscale	OR	0.974	0.918	0.953
		<i>p</i>	.601	.073	.441
		95% C.I.	0.880–1.076	0.837–1.008	0.844–1.077
	Friend subscale	OR	0.933	0.897	0.932
		<i>p</i>	.114	.031	.248
		95% C.I.	0.855–1.017	0.812–0.990	0.828–1.050
	Significant other subscale	OR	0.918	0.871	0.908
		<i>p</i>	.071	.009	.105
		95% C.I.	0.836–1.007	0.786–0.975	0.807–1.020

Note: OR of the association to different disorder groups compared to the no SP/DEP group at age 17 years, statistical significance, and C.I. at 95% level in logistic regression controlling covariates of age at T1, family structure at T1, mother's highest educational qualification at T1, father's highest educational qualification at T1, and externalizing symptoms at T1. SP = Social phobia (SPIN ≥ 24 , R-BDI < 8), DEP = depression (SPIN < 24 , R-BDI ≥ 8), and comorbid SP/DEP (SPIN ≥ 24 , R-BDI ≥ 8).

Table 4. Perceived social support at age 15 years and risk for disorders at age 17 years among boys without social phobia or depression at T1.

		Disorder status at age 17 years				
		<i>n</i> = disorder/no disorder				
		SP	DEP	Comorbid SP/DEP		
		<i>n</i> = 30/686	<i>n</i> = 14/686	<i>n</i> = 20/686		
Boys' perceived social support at age 15 years	Total score	OR	0.986	0.959	0.999	
		<i>p</i>	.380	.046	.955	
		95% C.I.	0.954–1.018	0.921–0.999	0.959–1.041	
	Family subscale	OR	1.015	0.909	1.037	
		<i>p</i>	.790	.121	.602	
		95% C.I.	0.907–1.137	0.805–1.025	0.904–1.190	
	Friend subscale	OR	0.945	0.933	0.985	
		<i>p</i>	.176	.238	.772	
		95% C.I.	0.870–1.026	0.832–1.047	0.888–1.092	
	Significant other subscale	OR	0.960	0.882	0.987	
		<i>p</i>	0.306	0.014	0.784	
		95% C.I.	0.899–1.038	0.798–0.975	0.896–1.086	

Note: OR of the association to different disorder groups compared to the no SP/DEP group at age 17 years, statistical significance, and C.I. at 95% level in logistic regression controlling covariates of age at T1, family structure at T1, mother's highest educational qualification at T1, father's highest educational qualification at T1, and externalizing symptoms at T1. SP = Social phobia (SPIN \geq 24, R-BDI $<$ 8), DEP = depression (SPIN $<$ 24, R-BDI \geq 8), and comorbid SP/DEP (SPIN \geq 24, R-BDI \geq 8).

Our findings of low perceived social support as a risk factor for depression are in accordance with those of earlier studies (Bettge et al., 2008; Heponiemi et al., 2006; Newman et al., 2007). After controlling for age, family structure, mother's and father's highest educational qualification, and externalizing symptoms at T1, low total perceived social support in total and support from significant other predicted depression at age 17 among both genders, and among girls low perceived support from peers predicted depression two years later. Different from earlier studies of middle adolescent samples, we found no association between low perceived social support from family and later depression (Aseltine et al., 1994; McDonald et al., 2010; Sheeber et al., 1997). Our different finding may be due to controlling for covariates, as controlling for them levelled out the predictive association between low family support and subsequent depression. Especially externalizing symptoms measured by YSR is important to control, because antisocial behaviour measured by YSR has found to be often comorbid with depression in earlier findings of analyses of our baseline sample (Ritakallio et al., 2010). Perceived social support had modifying effect to this comorbidity (Ritakallio et al., 2010).

Low perceived support from friends has been associated with later depression in some studies on mid-adolescent samples (McDonald et al., 2010; Schraedley et al., 1999) but not in all (Aseltine et al., 1994). In our study this was true among girls but not among boys. Thus support from friends seems to be more important for girls than for boys. Girls also have reported more perceived support from friends than boys in earlier studies as also in our study (Katainen et al., 1999; La Greca & Lopez, 1998). Girls may in general emphasize intimate dyadic relationships with friends, while boys may direct to larger peer groups, and friends have thus stronger meaning as source of support among girls than among boys (Facio & Batistuta, 2001). As low perceived social support from significant other was predictive to later depression among both genders, it seems that in middle adolescence both boys and girls need a close person to support them apart from their family and friends.

Low perceived social support from any source was not found to be a risk factor for social phobia without depression. Neither was low perceived family support nor low perceived support from significant other found to predict later social phobia in the study by LaGreca and Lopez (1998). In contrast to our findings, however, LaGreca and Lopez reported low perceived support from friends to be a predictor of subsequent social phobia (1998). The reason for this difference may be that our sample for risk factor analyses was free of both social phobia and depression at T1. As depression is associated with lower perceived social support in our study and in many earlier studies (Aseltine et al., 1994; Bettge et al., 2008; Hankin, 2009; Kaltiala-Heino et al., 2001; McDonald et al., 2010; Newman et al., 2007), and also associated with social phobia (Beesdo et al., 2007; Bittner et al., 2004; Lewinsohn, Gotlib, et al., 1997; Väänänen et al., 2011; Wittchen et al., 1999), it is of great importance to control for the effect of both of these disorders when studying risk factors.

Our finding that there was no association between low perceived social support and later comorbid social phobia and depression was unexpected, especially as there was an association between low perceived social support and later depression without social phobia. This finding may indicate, first, that comorbid social phobia and depression is more strongly linked to risk factors of social phobia than to risk factors of depression; second, that depression coexisting with social phobia develop differently compared to depression without social phobia; or third, that comorbid social phobia and depression is a qualitatively different disorder from social phobia or depression alone.

Low perceived social support has been associated with social phobia and depression in cross-sectional studies (Denny et al., 2004; Piko et al., 2009). As we hypothesized, the same was true in our study. All PSSS-R subscales were lower among affected than non-affected adolescents at ages 15 and 17 years. As could be expected, social support was lowest among those with both social phobia and depression and highest among those free from both disorders. Depressed adolescents perceived lower social support from their family than did adolescents with social phobia. This may be due to the nature of the disorders. Adolescents suffering from social phobia may turn more to their family to seek support than those suffering from depression. Contrary to what could be hypothesized due to the nature of these disorders, perceived support from outside the family was not lower among adolescents with social phobia than adolescents with depression. It may be that the depressed adolescent feels that nobody likes him/her and perceives less support from friends and significant other. An adolescent with social phobia may still have a good intimate relationship with a significant person and perceive support from that person.

As in earlier studies, girls reported higher perceived support than boys in all factors except family subscale (Bettge et al., 2008; Katainen et al., 1999; La Greca & Lopez, 1998). Family was an equal source of support for both genders in middle adolescence. This may indicate that girls reach out more outside the family for social support or that they utilize more support from outside the family than boys. Girls have found to be more relationship-oriented than boys (Gavin, Furman, & Furman, 1989). There were some gender differences in the patterns of how perceived support was associated with social phobia, depression, and comorbid social phobia and depression. This emphasizes the importance of studying girls and boys separately and taking gender into account when planning prevention and intervention programmes for adolescent suffering from social phobia and/or depression.

Methodological considerations

The strengths of the present study are the longitudinal design and a large population sample. Compulsory comprehensive school covers more than 99% of adolescents until age 16 in Finland. The cohort may thus be considered broadly representative of the age group studied.

There was a good response rate in the AMHC baseline survey. However, dropout at T2 was relatively high. Attrition was more common among boys than girls and might affect gender differences in perceived social support found in our study. Non-responders had more often depression among both genders in the baseline survey and lower perceived social support from family among boys. Thus, this must be taken into account in the interpretation of the results of the current study. This may have affected our result indicating that low perceived support from family was not a risk factor for later depression among boys. It may also have affected our finding of no gender differences in perceived social support from family. However, these assumptions are contra versed as there were no gender differences in cross-sectional analyses in the association between depression and perceived social support from family already at baseline. In addition, subjects without either disorder at baseline were used in longitudinal analyses. van Loon, Tjihuis, Picavet, Surtees, and Ormel (2003) have stated that even high levels of attrition may not necessarily affect the associations studied in health surveys (2003).

One limitation of this study is the lack of diagnostic interviews. However, the measures of the present study have previously been used in large community samples of adolescents. Adolescents have also been shown to be able to reliably report their symptoms in psychological disorders (Smith, Pelham, Gnagy, Molina, & Evans, 2000).

Another limitation is the lack of control for other possible disorders, which may affect our main results. It must be kept in mind that only a limited range of covariates can be controlled for in large epidemiologic studies. However, we controlled for externalizing symptoms, which is seldom done in studies on depression and anxiety.

As scores of PSSS-R were distributed in a non-Gaussian way, the use of logistic regression may not give accurate results. However, if the effects of covariants are to be controlled, logistic regression must be used. In large samples it could be reliably used (Tabachnick & Fidell, 2005).

Conclusions

Low perceived social support is not a shared risk factor for social phobia and depression in middle adolescence. Low social support predicts depression, but is not an antecedent of social phobia. Adolescents suffering from social phobia and depression perceive low support from several sources. Perceived social support should be a part of the clinical evaluation of adolescents suffering from these disorders and of planning preventive and intervention strategies. This may be done by promoting possibilities for supportive relationships and enhancing one's capability to utilize one's relationships as sources of social support. More research on risk factors and on the development of comorbid social phobia and depression is needed, as comorbid disorder was differently associated with social support than depression alone.

References

- Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4-18 and 1991 profile*. Burlington: Department of Psychiatry, University of Vermont.
- Angold, A., Costello, E. J., Farmer, E. M. Z., Burns, B., & Erkanli, A. (1999). Impaired but undiagnosed. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 129–137.
- Appleyard, K., England, B., & Sroufe, L. A. (2007). Direct social support for young high risk children: Relations with behavioral and emotional outcomes across time. *Journal of Abnormal Child Psychology*, 35, 443–457.
- Aseltine, R. H.Jr., Gore, S., & Colten, M. E. (1994). Depression and the social developmental context of adolescence. *Journal of Personality and Social Psychology*, 7, 52–263.
- Beck, A., & Beck, R. (1972). Screening depressed patients in family practice. A rapid technic. *Postgraduate Medicine*, 52, 81–85.

- Beck, A., Rial, W., & Rickels, K. (1974). Short form of depression inventory: Cross-validation. *Psychology Report*, 34, 1184–1186.
- Beesdo, K., Bittner, A., Pine, D. S., Stein, M. B., Hofler, M., Lieb, R., & Wittchen, H. U. (2007). Incidence of social anxiety disorder and the consistent risk for secondary depression in the first three decades of life. *Archives of General Psychiatry*, 64, 903–912.
- Bennet, D. S., Ambrosini, P. J., Bianchi, M., Barnett, D., Metz, C., & Rabinowich, H. (1997). Relationship of Beck Depression Inventory factors to depression among adolescents. *Journal of Affective Disorders*, 45, 127–134.
- Bettge, S., Wille, N., Barkmann, C., Schulte-Markwort, M., Rawens-Sieberer, U., & BELLA Study Group. (2008). Depressive symptoms of children and adolescents in a German representative sample: Results of the BELLA study. *European Child & Adolescent Psychiatry*, 17(Suppl. 1), 71–81.
- Bittner, A., Goodwin, R. D., & Wittchen, H. U. (2004). What characteristics of primary anxiety disorders predict subsequent major depressive disorder? *Journal of Clinical Psychiatry*, 65, 618–626.
- Blumenthal, J. A., Burg, M. M., Barefoot, J., Williams, R. B., Haney, T., & Zimet, G. (1987). Social support, type A behavior, and coronary artery disease. *Psychosomatic Medicine*, 49, 331–340.
- Chavira, D. A., Stein, M. B., Bailey, K., & Stein, M. T. (2004). Comorbidity of generalized social anxiety disorder and depression in a pediatric primary care sample. *Journal of Affective Disorders*, 80, 163–171.
- Connor, K. M., Davidson, J. R. T., Churchill, L. E., Sherwood, A., Foa, E., & Weisler, R. H. (2000). Psychometric properties of the Social Phobia Inventory (SPIN): New self-rating scale. *The British Journal of Psychiatry*, 176, 379–386.
- Costello, D. M., Swendsen, J., Rose, J. S., & Dierker, L. C. (2008). Risk and protective factors associated with trajectories of depressed mood from adolescence to early adulthood. *Journal of Consulting and Clinical Psychology*, 76, 173–183.
- Denny, S., Clark, T. C., Fleming, T., & Wall, M. (2004). Emotional resilience: Risk and protective factors for depression among alternative education students in New Zealand. *American Journal of Orthopsychiatry*, 74, 137–149.
- DeWit, D. J., Chandler-Coutts, M., Offord, D. R., King, G., McDougall, J., Specht, J., & Stewart, S. (2005). Gender differences in the effects of family adversity on the risk of onset of DSM-3-R social phobia. *Journal of Anxiety Disorders*, 19, 479–502.
- Essau, C. A., Conradt, J., & Petermann, F. (1999). Frequency and comorbidity of social phobia and social fears in adolescents. *Behaviour Research and Therapy*, 37, 831–843.
- Ezzell, C. E., Swenson, C. C., & Brondino, M. J. (2000). The relationship of social support to physically abused children's adjustment. *Child Abuse & Neglect*, 24, 641–651.
- Facio, A., & Batistuta, M. (2001). What makes Argentinian girls unhappy? A cross-cultural contribution to understanding gender differences in depressed mood during adolescence. *Journal of Adolescence*, 24, 671–680.
- Fountoulakis, K. N., Iacovides, A., Kleanthous, S., Samolis, S., Gougoulias, K., St Kaprinis, G., & Bech, P. (2003). The Greek translation of the symptoms rating scale for depression and anxiety: Preliminary results of the validation study. *BMC Psychiatry*, 3, 1–8.
- Fröjd, S., Marttunen, M., Pelkonen, M., von der Pahlen, B., & Kaltiala-Heino, R. (2006). Perceived financial difficulties and maladjustment outcomes in adolescence. *The European Journal of Public Health*, 16, 542–548.
- Fröjd, S., Marttunen, M., Pelkonen, M., von der Pahlen, B., & Kaltiala-Heino, R. (2007). Adult and peer involvement in help-seeking for depression in adolescent population. A two-year follow-up in Finland. *Social Psychiatry and Psychiatric Epidemiology*, 42, 945–952.
- Garnefski, N. (2000). Age differences in depressive symptoms, antisocial behaviour and negative perceptions of family, school, and peers among adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 1175–1181.
- Gavin, L. A., Furman, G., & Furman, W. (1989). Age differences in adolescents' perceptions of their peer groups. *Developmental Psychology*, 25, 827–834.
- Gren-Landell, M., Tillfors, M., Furmark, T., Bohlin, G., Andersson, G., & Svedin, C. G. (2009). Social phobia in Swedish adolescents, prevalence and gender differences. *Social Psychiatry and Psychiatric Epidemiology*, 44, 1–7.
- Hankin, B. L. (2009). Development of sex differences in depressive and co-occurring anxious symptoms during adolescence: Descriptive trajectories and potential explanations in a multiwave prospective study. *Journal of Clinical Child and Adolescent Psychology*, 38, 460–472.
- Hankin, B. L., & Abramson, L. Y. (2001). Development of gender differences in depression: An elaborated cognitive vulnerability-transactional stress theory. *Psychological Bulletin*, 127, 773–796.

- Heponiemi, T., Elovainio, M., Kivimäki, M., Pulkki, L., Puttonen, S., & Keltinkangas-Järvinen, L. (2006). The longitudinal effects of social support and hostility on depressive tendencies. *Social Science & Medicine*, *63*, 1374–1382.
- Johnson, H. S., Inderbitzen-Nolan, H., & Anderson, E. R. (2006). The Social Phobia Inventory: Validity and reliability in an adolescent community sample. *Psychological Assessment*, *18*, 269–277.
- Kaltiala-Heino, R., Rimpelä, M., Rantanen, P., & Laippala, P. (1999). Finnish modification of the 13-item Beck Depression Inventory in screening an adolescent population for depressiveness and positive mood. *Nordic Journal of Psychiatry*, *53*, 451–457.
- Kaltiala-Heino, R., Rimpelä, M., Rantanen, P., & Laippala, P. (2001). Adolescent depression: The role of discontinuities in life course and social support. *Journal of Affective Disorders*, *64*, 155–166.
- Katainen, S., Räikkönen, K., & Keltinkangas-Järvinen, L. (1999). Adolescent temperament, perceived social support and depressive tendencies in young adulthood. *European Journal of Personality*, *13*, 183–207.
- Kawachi, I., & Bergman, L. F. (2001). Social ties and mental health. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *78*, 458–467.
- Kessler, K. S., Gardner, C. O., & Prescott, C. A. (2002). Toward a comprehensive developmental model for major depression in women. *The American Journal of Psychiatry*, *159*, 1133–1145.
- Kessler, K. S., Gardner, C. O., & Prescott, C. A. (2006). Toward a comprehensive developmental model for major depression in men. *The American Journal of Psychiatry*, *163*, 115–124.
- Kessler, R. C., Avenevoli, S., & Merikangas, K. R. (2001). Mood disorders in children and adolescents: An epidemiologic perspective. *Biological Psychiatry*, *49*, 1002–1014.
- Kessler, R. C., Stang, P., Wittchen, H. U., Stein, M., & Walters, E. E. (1999). Lifetime co-morbidities between social phobia and mood disorders in the US National Comorbidity Survey. *Psychological Medicine*, *29*, 555–567.
- Kessler, R. C., & Walters, E. E. (1998). Epidemiology of DSM-III-R Major depression and minor depression among adolescents and young adults in the National Comorbidity Survey. *Depression & Anxiety*, *7*, 3–14.
- La Greca, A. M., & Lopez, N. (1998). Social anxiety among adolescents: Linkages with peer relations and friendships. *Journal of Abnormal Child Psychology*, *26*, 83–94.
- Lewinsohn, P. M., Gotlib, I. H., & Seeley, J. R. (1997). Depression-related psychosocial variables: Are they specific to depression in adolescents. *Journal of Abnormal Psychology*, *106*, 365–375.
- Lewinsohn, P. M., Hops, H., Roberts, R. E., Seeley, J. R., & Andrews, J. A. (1993). Adolescent psychopathology: I. Prevalence and incidence of depression and other DSM-III-R disorders in high school students. *Journal of Abnormal Psychology*, *102*, 133–144.
- Lewinsohn, P. M., Rohde, P., & Seeley, J. R. (1998). Major depressive disorder in older adolescents: Prevalence, risk factors, and clinical implications. *Clinical Psychology Review*, *18*, 765–794.
- Lewinsohn, P. M., Rohde, P., Seeley, J. R., Klein, D. N., & Gotlib, I. H. (2000). Natural course of adolescent major depressive disorder in a community sample: Predictors of recurrence in young adults. *The American Journal of Psychiatry*, *157*, 1584–1591.
- Lewinsohn, P. M., Zinbarg, R., Seeley, J. R., Lewinsohn, M., & Sack, W. H. (1997). Lifetime comorbidity among anxiety disorders and other mental disorders in adolescents. *Journal of Anxiety Disorders*, *11*, 377–394.
- van Loon, A., Tijhuis, M., Picavet, S., Surtees, P., & Ormel, J. (2003). Survey non-response in Netherlands: Effects on prevalence estimates and associations. *Annals of Epidemiology*, *13*, 105–110.
- McDonald, K. L., Bowker, J. C., Rubin, K. H., Laursen, B., & Duchene, M. S. (2010). Interactions between rejection sensitivity and supportive relationships in the prediction of adolescents' internalizing difficulties. *Journal of Youth and Adolescence*, *39*, 563–574.
- Merikangas, K. R., Whitaker, A., Angst, J., Eaton, W., Canino, G., Rubio-Stipec, M., ... Kupfer, D. (1996). Comorbidity and boundaries of affective disorders with anxiety disorders and substance misuse: Results of an International Task Force [Comorbidity of Mood Disorders]. *British Journal of Psychiatry*, *168*, 58–67.
- Newman, B. M., Newman, P. R., Griffen, S., O'Connor, K., & Spas, J. (2007). The relationship of social support to depressive symptoms during the transition to high school. *Adolescence*, *42*, 441–459.
- Piko, B. F., Kovacs, E., & Fitzpatrick, K. M. (2009). What makes a difference? Understanding the role of protective factors in Hungarian adolescents' depressive symptomatology. *European Child & Adolescent Psychiatry*, *18*, 617–624.
- Raitasalo, R. (2007). *Mielialakysely. Suomen oloihin Beckin lyhyen depressiokyselyn pohjalta kehitetty masennusoireilun ja itsetunnon kysely*. Kela, Sosiaali- ja terveysturvan tutkimuksia 86, Helsinki [Mood questionnaire. Finnish modification of the short form of the Beck Depression Inventory

- measuring depression symptoms and self-esteem. Abstract in English]. Helsinki: The Social Insurance Institution.
- Ranta, K., Kaltiala-Heino, R., Rantanen, P., & Marttunen, M. (2009). Social phobia in Finnish general adolescent population: Prevalence, comorbidity, individual and family correlates, and service use. *Depression & Anxiety, 26*, 528–536.
- Ranta, K., Kaltiala-Heino, R., Rantanen, P., Tuomisto, M. T., & Marttunen, M. (2007). Screening social phobia in adolescents from general population: The validity of the Social Phobia Inventory (SPIN) against a clinical interview. *European Psychiatry, 22*, 244–251.
- Ritakallio, M., Luukkala, T., Marttunen, M., Pelkonen, M., & Kaltiala-Heino, R. (2010). Comorbidity between depression and antisocial behavior in middle adolescence: The role of perceived social support. *Nordic Journal of Psychiatry, 64*, 164–171.
- Roberts, R. E., Lewinsohn, P. M., & Seeley, J. R. (1995). Symptoms of DSM-III-R major depression in adolescence: Evidence from an epidemiological survey. *Journal of the American Academy of Child and Adolescent Psychiatry, 34*, 1608–1617.
- Sartor, C. E., & Youniss, J. (2002). The relationship between positive parental involvement and identity achievement during adolescence. *Adolescence, 37*, 221–234.
- Schraedley, P. K., Gotlib, I. H., & Hayward, C. (1999). Gender differences in correlates of depressive symptoms in adolescents. *Journal of Adolescent Health, 25*, 98–108.
- Sheeber, L., Hops, H., Alpert, A., Davis, B., & Andrews, J. (1997). Family support and conflict: Prospective relations to adolescent depression. *Journal of Abnormal Child Psychology, 25*, 333–344.
- Shields, M. (2004). Social anxiety disorder-beyond shyness. *Health Report, 15*(Suppl.), 45–61.
- Smith, B. H., Pelham, W. E., Gnagy, E., Molina, B., & Evans, S. (2000). The reliability, validity, and unique contributions of self-report by adolescents receiving treatment for attention-deficit/hyperactivity disorder. *Journal of Consulting and Clinical Psychology, 68*, 489–499.
- Tabachnick, B. G., & Fidell, L. S. (2005). *Using multivariate statistics* (5th ed.). Boston, MA: Pearson AB.
- Väänänen, J., Fröjd, S., Ranta, K., Marttunen, M., Helminen, M., & Kaltiala-Heino, R. (2011). Relationship between social phobia and depression differs between boys and girls in mid-adolescence. *Journal of Affective Disorders, 133*, 97–104.
- Wittchen, H. U., & Fehm, L. (2001). Epidemiology, patterns of comorbidity, and associated disabilities of social phobia. *The Psychiatric Clinics of North America, 24*, 617–641.
- Wittchen, H. U., Stein, M. B., & Kessler, R. C. (1999). Social fears and social phobia in a community sample of adolescents and young adults: Prevalence, risk factors and co-morbidity. *Psychological Medicine, 29*, 309–323.