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## Depressed Adolescents Grow Up

Prevalence, course and clinical risk factors  
of non-suicidal self-injury, suicidal ideation  
and suicide attempts

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## TIIVISTELMÄ

Nuoruusikä on merkittävä riski itsetuhoisen käyttäytymisen alkamiseen. Masennus on yleisin mielenterveyden häiriö nuorilla, jotka vahingoittavat itseään ilman tarkoitusta tehdä itsemurha, sekä niillä, joilla on itsemurha-ajatuksia tai itsemurhayrityksiä. Itsensä vahingoittamisella tarkoitetaan tarkoituksellista oman ruumiin vahingoittamista ilman itsemurhatarkoitusta. Suuri osa itsetuhoisuutta koskevasta tutkimustiedosta ei ole erottanut itsensä vahingoittamista itsemurhayrityksistä, joissa on selkeä tarkoitus kuolla. Myös näiden eri itsetuhoisuusmuotojen riskitekijöiden yhtäläisyyksiä tai eroavuuksia on tutkittu vähän.

Tämä tutkimus on osa Nuorten Depressio-tutkimusta, joka on toteutettu yhteistyössä Terveiden- ja Hyvinvoinnin laitoksen Mielenterveyden ja Alkoholitutkimuksen-osaston ja Helsingin Yliopistollisen keskussairaalan (HYKS) Peijaksen sairaalan tulosalueen nuorisopsykiatrisen klinikan kanssa. Tutkimukseen osallistuneet nuoret olivat hakeutuneet hoitoon nuorisopsykiatriselle poliklinikalle. Tutkimuksen alkumittauksessa haastateltiin puolistrukturoidun haastattelun (K-SADS-PL) avulla 218 DSM-IV masennusdiagnoosin saanutta nuorta (13-19 vuotiaita). Lisäksi tutkimustietoa kerättiin nuoren täyttämällä standardoiduilla psykometrisillä kyselylomakkeilla. Itsetuhoisen käyttäytyminen arvioitiin K-SADS-PL haastattelulomakkeen itsetuhoisuusosion kysymyksillä. Alkumittauksen jälkeen tutkimuksessa mukana olevat nuoret arvioitiin uudelleen noin yhden vuoden (n=189) ja kahdeksan vuoden (n=148) kuluttua haastattelemalla heidät puoli strukturoidulla diagnostisella haastattelulla (K-SADS-PL yhden vuoden kohdalla, SCID-I kahdeksan vuoden kohdalla) ja standardoiduilla psykometrisillä kyselylomakkeilla.

Tutkimuksen alkumittauksessa puolella tutkittavista oli itsensä vahingoittamista, itsemurha-ajatuksia tai itsemurhayrityksiä kun itsetuhoisuus luokiteltiin kaikissa it-

setuhoisuuden muodoissa vakavimman luokituksen mukaan. Nuoren itsetuhoisuuden esiintymiseen ei vaikuttanut se, oliko nuorella masennushäiriö vai masennushäiriö ja lisäksi muu mielenterveyden häiriö. Nuorempi ikä ja alhainen psykososiaalinen toimintakyky ennustivat nuoren itsensä vahingoittamista, masennusoireet ja alhainen psykososiaalinen toimintakyky ennustivat itsemurha-ajatuksia ja itsemurhayrityksiä.

Tutkimuksen alkutilanteessa 34 %:lla (73/218) masentuneista nuorista oli itsensä vahingoittamista. Itseään vahingoittaneet masentuneet nuoret olivat iältään nuorempia, kokivat saavansa vähemmän tukea perheeltään, heillä oli enemmän masennusoireita ja he käyttivät enemmän alkoholia kuin ne masentuneet nuoret, joilla ei ollut itsetuhoista käyttäytymistä. Nuorilla, joilla oli itsensä vahingoittamisen lisäksi itsemurha-ajatuksia tai itsemurhayrityksiä, oli enemmän masennus- ja ahdistusoireita kuin vain itseään vahingoittavilla nuorilla.

Vuoden seuranta-aikana itsetuhoinen käyttäytyminen väheni niin, että kolmasosalla tutkittavista masentuneista nuorista oli itseään vahingoittavaa käyttäytymistä, itsemurha-ajatuksia tai itsemurhayrityksiä. Alkoholinkäyttö ja muu samanaikainen mielenterveyden häiriö masennuksen lisäksi ennustivat kaikkia itsetuhoisuuden muotoja. Vuoden seurannassa olevista nuorista 56% oli tutkimuksen alkumittauksessa itsetuhoisia ja puolet heistä olivat itsetuhoisia edelleen vuoden seurannan aikana. Sukupuolena nainen ja masennuksen lisäksi jokin muu mielenterveyden häiriö ennustivat itsetuhoisen käyttäytymisen jatkumista.

Kun tutkittiin miten itsensä vahingoittaminen, itsemurhayritykset ja valikoidut kliiniset erityispiirteet ennustivat itsensä vahingoittamista vuoden seurannan aikana, niin itsensä vahingoittamisen riskiä lisäsivät alkumittaukseen mennessä tapahtunut itsensä vahingoittaminen, nuori ikä ja alkoholin käyttö. Ainoa riskitekijä itsensä vahingoittamiselle oli yhdestä kahdeksaan vuoteen jatkuneessa seurantavaiheessa itsensä vahingoittaminen. Tutkittavien itsemurhayrityksiä ennustivat alhainen kaverituki ja alkoholin käyttö sekä yhden vuoden että yhdestä kahdeksaan vuoteen jatkuneen seurantajakson aikana.

Merkittäväällä osalla masennuksen vuoksi hoitoa hakeneista nuorista oli itsensä vahingoittamista ja usein siihen liittyi itsemurha-ajatuksia tai itsemurhayrityksiä. Masennuksen vuoksi hoitoa hakeneilla nuorilla itsensä vahingoittaminen ennusti myöhempää itsetuhoista käyttäytymistä. Masennuksen lisäksi nuoren saama sosiaalinen tuki ja alkoholin käyttö ovat tärkeitä huomioida ehkäistäessä tulevaa itsetuhoista käyttäytymistä.

## ABSTRACT

**Background.** Depression is the most common disorder among adolescents with non-suicidal self-injury, suicidal ideation and suicide attempts, and adolescence is also a high risk period for the first onset of suicidal behaviour. Most research on suicidal behaviour has failed to distinguish non-suicidal self-injury from suicide attempts with clear intent to die and risk factors for these different kinds of behaviours.

**Methods.** This study is part of the Adolescent Depression Study (ADS), a collaborative study between the Department of Adolescent Psychiatry, the Peijas Medical Health Care District (PMCD) of Helsinki University Central Hospital and the Department of Mental Health and Substance Use Services, National Institute for Health and Welfare, Helsinki, Finland. The study population was drawn from adolescent psychiatric outpatient clinics. At baseline, depressed adolescent outpatients (n=218) aged 13-19 years were interviewed, diagnosed using K-SADS-PL for DSM-IV Axis I diagnoses. The subjects were further assessed using self-report questionnaires and observer rating scales. Suicidal behaviour was assessed by K-SADS-PL suicidality items. After the baseline evaluation, the adolescent outpatients were re-evaluated approximately one year (n=189) and eight years later (n=148) with structured diagnostic interviews (K-SADS-PL at the one-year follow-up, SCID-I at the eight-year follow-up), self-report scales and observer rating scales.

**Results.** At baseline, half of the adolescents reported non-suicidal self-injury, suicidal ideation or suicide attempts. There was no difference in prevalence of suicidal behaviour between non-comorbid and comorbid mood disorder groups. Younger age and poor psychosocial functioning were associated with non-sui-

cidal self-injury and self-reported depressive symptoms, and poor psychosocial functioning was associated with suicidal ideation and suicide attempts.

At baseline, seventy-three (34%) of the 218 depressed adolescent outpatients had non-suicidal self-injury. Depressed adolescents with non-suicidal self-injury were younger, had less perceived support from family, had more severe depressive symptoms and used alcohol more than non-suicidal depressed adolescents. Adolescents with non-suicidal self-injury and suicidal ideation or suicide attempts had more depressive and anxiety symptoms than adolescents with only non-suicidal self-injury.

During the one-year follow-up, the prevalence of any suicidality declined to one-third of all participants, and almost three-quarters of suicidal adolescents had non-suicidal self-injury. Alcohol use and mood disorder with Axis I comorbidity at baseline predicted non-suicidal self-injury, suicidal ideation and suicide attempts during follow-up. 56% of the subjects, who were re-evaluated after one year, were suicidal at baseline, and half of them were also suicidal during follow-up. Female gender and mood disorder comorbidity predicted continuing suicidality.

When studying non-suicidal self-injury, suicide attempts and selected clinical characteristics as predictors for follow-up, non-suicidal self-injury in the one-year follow-up was predicted by baseline non-suicidal self-injury, younger age and alcohol use, whereas the only significant predictor for non-suicidal self-injury between the one- and eight-year follow-ups was non-suicidal self-injury. Suicide attempts were predicted both in the one-year follow-up and in the period between the one- and eight-year follow-ups by alcohol use and low perceived peer support.

**Conclusions.** The rate of non-suicidal self-injury is relatively high among depressed adolescent outpatients and it often co-occurs with suicidal ideation and suicide attempts. Among depressed outpatients non-suicidal self-injury is a strong predictor of suicidal behaviour, and other factors beyond depression, such as alcohol use and availability of social support, must also be addressed to prevent the recurrence of suicidal behaviour.

## ABBREVIATIONS

ADAPT	Adolescent Depression Antidepressants and Psychotherapy Trial
ADS	Adolescent Depression Study
APA	American Psychiatric Association
AUDIT	Alcohol Use Disorders Identification Test
BAI	Beck Anxiety Inventory
BDI	Beck Depression Inventory
DSH	Deliberate self-harm
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, fourth edition
DSM-V	Diagnostic and Statistical Manual of Mental Disorders, fifth edition
GAF	Global Assessment of Functioning
GHQ	General Health Questionnaire
HUCH	Helsinki University Central Hospital
ICD-10	International Classification of Diseases, 10 <sup>th</sup> edition
K-SADS-PL	Schedule for Affective Disorders and Schizophrenia for School-Aged Children – Present and Life-time
LEC	Life-events Checklist
MDD	Major Depressive Disorder
NSSI	Non-suicidal self-injury
PMCD	Peijas Medical Health Care District
PSSS-R	Perceived Social Support Scale-Revised
SA	suicide attempt
SCID-I	Structured Clinical Interview for DSM-IV Axis I Disorders
SCID-II	Structured Clinical Interview for DSM-IV Axis II Personality Disorders
SD	Standard Deviation
SES	Socioeconomic status
SI	suicidal ideation
TADS	Treatment for Adolescents with Depression Study
TORDIA	Treatment of Resistant Depression in Adolescents
WHO	World Health Organization

## LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following original publications:

I Tuisku V, Pelkonen M, Karlsson L, Kiviruusu O, Holi M, Ruutu T, Punamäki R-L, Marttunen M. Suicidal ideation, deliberate self-harm behaviour and suicide attempts among adolescent outpatients with depressive mood disorders and comorbid Axis I disorders. *Eur Child Adolesc Psychiatry* 2006 Jun; 15:199–206.

II Tuisku V, Pelkonen M, Kiviruusu O, Karlsson L, Ruutu T, Marttunen M. Factors associated with deliberate self-harm behaviour among depressed adolescents. *J Adolesc* 2009; 32: 1125–1136.

III Tuisku V, Pelkonen M, Kiviruusu O, Karlsson L, Marttunen M. Alcohol use and psychiatric comorbid disorders predict deliberate self-harm behaviour and other suicidality among depressed adolescent outpatients in one-year follow-up. *Nord J Psychiatry* 2012; 66: 268–275.

IV Tuisku V, Kiviruusu O, Pelkonen M, Karlsson L, Strandholm T, Marttunen M. Depressed adolescents as young adults - predictors of suicide attempt and non-suicidal self-injury an 8-year follow-up period. *J Affect Disord* 2014; 152–154:313–319.

# INTRODUCTION

## 1. Adolescent development

Adolescence begins with biological changes related to puberty, and ends in the domain of social roles of adulthood. Pubertal development is marked by physiological, psychological and social changes for the adolescent. Physical changes related to hormonal and sexual maturation initiate psychological development in early adolescence, which begins at the age of 10-12 years. The primary body image stemming from earlier development has to be changed so that the adolescent body with its characteristically adult features can become integrated with the psychological image of itself (Laukkanen et al., 1998; Becker et al., 2007).

Significant changes in brain structure and function take place during adolescence. The onset of puberty in early adolescence activates changes in affective systems underlying motivation and emotion in ways that interact with cognitive control systems (Dahl, 2008). The onset of pubertal maturation announces a rapid physical growth, onset of sexual maturation, activation of new drives and affective changes, including increased self-consciousness and ignition of romantic interests (Dahl, 2008). In middle adolescence (15-17 years) the majority of changes of puberty have taken place. In contrast to the relatively early and rapid changes in affective systems that appear to be linked to pubertal maturation in early adolescence, another set of cognitive skills and, more broadly, competence in self-control of behaviour, seem to develop gradually across middle adolescence, late adolescence (18-22 years) and young adulthood (Dahl, 2008).

Major changes also occur in the nature of family and social relations. Changes in parent-child relationships necessarily mean that parental support and structure are reduced. However, parents remain a vital source of support even if early adolescents would rather be with their friends than with their family (Allen and Sheeber, 2009). In middle adolescence, adolescents broaden their relationships with adults outside of the family. Late adolescence is characterized by further development of emotional, social and financial independence from parents. Adolescents are also substantially more sociable than younger children, spending their time in the company of their peers. In late adolescence, one-on-one relationships become more intimate and trusting (Steinberg and Morris, 2001). In addition, romantic relationships emerge, prompted by new motivational systems and sexual development (Steinberg et al., 2006).

Adolescence is a vulnerable period during which the first signs of both transient and more severe developmental and psychological problems appear (Kim-Cohen et al., 2003; Dahl, 2008). Early adolescence is characterized by puberty-driven increases in reward seeking and social sensitivity. At the same time, reductions in parental supervision and increases in family conflict and instability in peer relationships challenge adolescents. Engaging less cognitive control may permit a relatively greater influence from affective systems that influence decision making and behaviour, which increases adolescents' vulnerability to some social and peer contexts that activate strong feelings (Dahl, 2008). How well the adolescent copes with these changes may depend on how well the adolescent copes with stress in general, as well as the psychological vulnerability of the individual before puberty.

## 2. Depression in adolescence

The term mood describes an overall emotional state that may affect all aspects of an individual's life and perceptions. Mood disorders are pathologically elevated or depressed disturbances of mood, and include full or partial episodes of depression or mania. Depression is conceptualized as a disorder of affective functioning. It is inextricably linked with cognitive, biological, sexual and interpersonal processes also undergoing rapid and marked development during adolescence (Allen and Sheeber, 2009). Depression is defined by the cluster of specific symptoms and specified duration with associated impairment (International Classification of Diseases, 10<sup>th</sup> edition, ICD-10, Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> edition, DSM-5). Depression in adolescents is more often missed than it is in adults, possibly because of the prominence of irritability, mood reactivity, and fluctuating symptoms among adolescents (Thapar et al., 2012).

Depression is relatively uncommon in pre-pubertal children (Egger and Angold, 2006). In early adolescence, the incidence and prevalence of depression begins to rise more sharply in girls than in boys (Maughan et al., 2013). From middle to late adolescence the median 12-month prevalence of major depression is in the region of 4-5% (Thapar et al., 2012). Past-year estimates of the prevalence of major depressive disorders in early adulthood range from 10-17% (Moffit et al., 2010) with women about twice as likely to be affected as men.

By 15 years of age, girls are twice as likely as boys to have experienced a depressive episode (Cyranowski et al., 2000; Thapar et al., 2012). Pubertal stage has been associated with girls' depressive symptoms independently of age-shifted explanations to a view of puberty as a transition point in risk, where there is an interaction between biological and psychosocial influences (Graber et al., 2004; Kessler et al.,

2003; Thapar et al., 2012). Rapid hormonal changes during pubertal development seem to be the factor that is associated with affect, suggesting that depression is directly linked to pubertal changes in hormone-brain relations (Graber et al., 2004; Thapar et al., 2012). Such changes may be linked to an emergence of a heightened affiliative need in girls compared with boys at puberty (Patton et al., 2007; Thapar et al., 2012). Additionally, for girls, increased body dissatisfaction has been found to mediate the association between early maturation and depressive symptoms (Graber et al., 2004).

Clinical studies of depression in adolescents show that it is a chronic and recurrent condition: although most episodes remit within a year, the risk of recurrence in clinical samples is high with 50-70 % likely to develop a further episode within five years (Dunn and Goodyer, 2006; Thapar et al., 2012). Longitudinal studies have determined the effects of adolescent depression on future mental health, and have highlighted a strong continuity towards psychiatric morbidity in the adult population (Fombonne et al., 2001; Lewinsohn et al., 2003; Thapar et al., 2012). The developmentally driven changes, that occur during early adolescence and result in an increased cohort-wide vulnerability to depression, may provide clues as to salient individual differences that render individuals more vulnerable to depression during other phases of life.

## 2.1. Comorbidity in adolescent depression

Throughout the life course, depression is comorbid with other psychiatric disorders. Studies on adolescent depression both in community and clinical samples report high prevalence (40-70%) of comorbid disorders (Kessler et al., 2001; Thapar et al., 2012) and over 10% show two or more comorbid disorders (Kessler et al., 2001; Thapar et al., 2012).

Anxiety disorders are the most common comorbid disorders in adolescent depression, affecting up to three-quarters of depressed adolescents (Kessler et al., 2001; Thapar et al., 2012), while overlaps with disruptive disorders, oppositional defiant disorder and conduct disorder are also common (Maughan et al., 2013; Thapar et al., 2012). Comorbidity is especially increased in adolescents with severe depression (Thapar et al., 2012). In general, comorbidity in adolescent depression is associated with psychosocial impairment (Kessler et al., 2012; Lewinsohn et al., 2003), with a higher risk for recurrence of depressive episodes and an increased use

of mental health services (Aalto-Setälä et al., 2002; Lewinsohn et al., 2003; Kessler et al., 2012; Thapar et al., 2012).

Associations between depression and anxiety are high throughout the life course, but their order of emergence appears to vary systematically across development (Moffitt et al., 2007). Between childhood and early adolescence anxiety typically precedes depression (Wittchen et al., 2000). However, from later adolescence onwards, the temporal sequence runs in both directions: anxiety predicts depression, but depressive disorders also predict later anxiety (Moffitt et al., 2007).

### 3. Suicidality in adolescents

#### 3.1. Suicidal ideation, suicide attempts, and suicide

Adolescence and early adulthood are generally seen as periods when there is a high risk for the first onset of suicidal behaviour (Moran et al., 2012; Ougrin et al., 2012). The incidence rate of suicidal ideation, suicide attempts and suicides increase sharply from childhood to adolescence (Nock, 2010). Developmental difficulties may contribute to continuity in risk or a strengthening of risks for emotional and behavioural dysregulation. Adolescence is often marked by higher levels of emotional reactivity, increased risk taking behaviours and increased strivings for autonomy, which may result in conflict with previous sources of support (Dahl, 2004; Pelkonen et al., 2011). Therefore, risks for suicidal behaviour may be heightened during adolescence, particularly in the context of psychiatric disorders associated with increased emotionality or decreased inhibitions (Goldston et al., 2009; Pelkonen et al., 2011).

Suicidal ideation (SI) refers to having thoughts about ending one's life (Nock, 2010). Suicide attempt (SA) refers to engagement in potentially self-injurious behaviour in which there is at least some intent to die (Nock 2010). Suicide is defined as cause of death on a death certificate (Meyer et al., 2010).

The first onset of suicidal behaviour increases dramatically during adolescence (Nock et al., 2008). Population-based studies have established that suicidal ideation and suicide attempts in adolescents are relatively common, with up to 30% of adolescents reporting lifetime suicidal thoughts and around 10% reporting a lifetime suicide attempt (Evans et al., 2005). Adolescents report higher levels of suicidal ideation than any other age group (Nock et al., 2008). Approximately one-third of adolescents with suicidal ideation go on to develop a suicide plan during adoles-

cence, approximately 60% of those with a plan will attempt suicide, and most of the adolescents who make this transition do so within the first year after onset (Nock et al., 2013). Among community-based samples, as many as 4-8% of adolescents report having made at least one suicide attempt (Muehlenkamp and Gutierrez, 2007; Nock et al., 2008). Among clinical samples estimates are higher, 24-33 % of adolescents reporting a history of SA (Asarnow et al., 2011).

National rates of suicide for adolescents should be compared with caution. During the last decade, adolescent suicide rates have increased in many countries with most of the increase being due to more young men committing suicide (WHO, 2014). However, the trends in rates differ between individual countries. In Finland, youth suicide rates have declined approximately one third during the past two decades and are still declining (Statistics Finland, 2011, Statistics Finland, 2012). In Finland, 37% of all deaths among 15-24 years age group were suicides (Statistics Finland, 2012) and suicide was the second leading cause of death among 15-29 years (WHO, 2014). Globally, among young adults 15-29 years of old, suicide accounts for 17.6% of all deaths and is the second leading cause of death in 15-29 years of old (WHO, 2014). Although females have higher rates of non-lethal suicidal behaviour, males have approximately 3-4 times higher rates of suicide deaths (WHO, 2014), a difference due in part to the more lethal methods used by males in their suicide attempts (Nock et al., 2013). Due to the growing risk for suicide with increasing age, adolescents can be regarded as one of the main target populations of suicide prevention.

### 3.2. Non-suicidal self-injury

Non-suicidal self-injury (NSSI) refers to direct and deliberate destruction of body tissue in the absence of any observable intent to die (e.g. cutting, burning) (Nock, 2010). Within direct self-injurious behaviours, an important distinction is made between phenomena that are suicidal in nature (i.e. in which there is at least some intent to die from the behaviour), and those that are non-suicidal, in which there is no intent to die (Nock, 2010). Determination of a person's intent during self-injury is based primarily on self-report, which is an imperfect method that possibly includes bias and ambivalence to dying. Therefore, the convention used by most researchers and clinicians is to classify behaviours where there is any evidence of intent to die as suicidal (Nock, 2010).

Although NSSI and suicidal behaviour with suicidal intent are both forms of self-injurious behaviour, these behaviours are differentiated on the basis of intention, frequency and lethality (Guertin et al., 2001; Muehlenkamp and Gutierrez, 2007). NSSI usually involves low lethality methods (e.g. biting, burning, cutting), whereas SA tends to involve higher lethality methods such as drug overdose or hanging (Andover and Gibb, 2010). NSSI tends to occur more frequently as compared to SA, particularly in clinical samples (Nock and Prinstein, 2004; Nock et al., 2006). Despite the important differences between NSSI and SA, these two self-injurious behaviours commonly co-occur among community-based and clinical samples (Nock et al., 2006; Nock, 2010). In outpatient samples of adolescents, 33-37% of those with a history of NSSI also report having made at least one suicide attempt (Asarnow et al., 2011).

Research on NSSI is complicated by the multiple terminologies used to describe the behaviour. Actions with a low likelihood of death but covered by the term “self-harm” have been described as suicidal behaviours, deliberate self-harm, other self-harm behaviours, self-mutilation, self-wounding and self-injurious behaviour (Nock, 2010; Skegg, 2005). A suicide attempt, by definition, is an intentional action to end life (Nock et al., 2006; Nock, 2010). Many studies published in North America and in Canada have employed the term “non-suicidal self-injury” (NSSI); the deliberate, self-inflicted destruction of body tissue without suicidal intent (Muehlenkamp et al., 2012). “Deliberate self-harm” (DSH), on the other hand, has been used predominantly in European countries and Australia as a more encompassing term for self-injurious behaviours, both with and without suicidal intent, that have non-fatal outcomes (Madge et al., 2008; Skegg, 2005). The most serious forms of DSH relate closely to suicide, while behaviours at the milder end of the spectrum merge with other reactions to emotional pain (Skegg, 2005). Previous studies have shown that it is difficult to draw the line between SA and DSH of adolescents because of the serious forms of DSH, and complexity and mix of intentions behind the latter (Skegg, 2005). Therefore it has been suggested that all self-harm behaviours should be considered along a continuum of suicidality (Muehlenkamp and Gutierrez, 2007). In the past ten years the number of scientific papers published annually on NSSI has more than tripled (ISI Web of Knowledge 2009). As research on non-suicidal self-harm behaviour has increased, scientists and clinicians have begun to make more careful distinctions and to use more consistent terms and definitions for this behaviour (Nock, 2010). The convention used by most researchers is to classify behaviour in which there is no evidence of any intent to die as NSSI.

### 3.2.1. *The prevalence of non-suicidal self-injury*

There are two definitions of non-suicidal self-injury (NSSI and DSH) and these two definitions lead to the use of different assessments and inclusion of specific self-injurious behaviours, which likely contribute to the varying prevalence estimates (Muehlenkamp et al., 2012). More than 20% of adolescents may self-injure with or without suicidal intent (Wilkinson, 2013). In an epidemiological study of adolescents (age 14-17 years) within seven European countries, the average lifetime prevalence estimate for DSH (includes self-injury both with and without suicidal intent) was 17.8% and the 12-month prevalence was 11.5% (Madge et al., 2008). A more recent cross-national study suggested an even higher 12-month prevalence rate of 24% for NSSI (Giletta et al., 2012). Among 13-18 years adolescents in Finland, the lifetime prevalence of self-cutting was 11.5% and that of other self-harm 10.2% (Laukkanen et al., 2009). The rates of NSSI are higher in clinical samples (Nock, 2010). In a systematic review of 52 studies reporting on the prevalence of NSSI (non-suicidal self-injurious behaviour) and DSH (suicidal and non-suicidal self-injury) across different countries (lifetime, 12-month, 6-month) no significant differences were found between the prevalence of NSSI (18.0%) and DSH (16.1%) (Muehlenkamp et al., 2012). It seems that if actual rates of self-injury (DSH and NSSI) have been increasing, they have largely stabilized in the past five or so years (Muehlenkamp et al., 2012).

The risk for self-harm increases substantially across pubertal stage (Patton et al., 2007). Across both community and clinical samples, NSSI tends to have its onset in adolescence and it most commonly occurs between the ages of 12-15 years (Hawton and James, 2005; Laukkanen et al., 2013; Muehlenkamp and Gutierrez, 2007; Nock and Prinstein, 2004; Nock, 2010). A substantial reduction in reported self-harm (with or without suicidal intent) occurs in middle to late adolescence continuing into young adulthood (Moran et al., 2012). Much recent attention has focused on early adolescent discrepancies between emotions and emotional control. Brain maturation continues well into late adolescence, particularly in brain regions linked to regulation of behaviour and emotions (Patton et al., 2007). Such brain changes correlate with the development of self-control and mature judgment, and continue for over a decade after initiation of puberty (Dahl, 2008; Patton et al., 2007). Among 12-15 years adolescents, the older age had a protective effect for risk of self-harm with or without suicidal intent (Patton et al., 2007).

The prevalence of NSSI is significantly higher in females than males (Laukkanen et al., 2009; Muehlenkamp and Gutierrez, 2007; Ross and Heath, 2002; Wilkinson, 2013). Studies assessing NSSI among adults do not report gender differences in the prevalence of NSSI in clinical or community-based samples (Bureau et al., 2010; Darke et al., 2010), suggesting that gender differences are more pronounced in early adolescence (Hamza et al., 2012). When considering deliberate self-injury with or without suicidal intent among adolescents, attention has to be paid to their ongoing psychological development, which includes integrating pubertal changes and sexuality with self-image. Early puberty in females has been associated with emotional problems (Patton et al., 2007). It has been suggested that since girls reach puberty earlier than boys, they express through self-injurious behaviour their inability to achieve psychological homeostasis in more adaptive ways (Patton et al., 2007; Zila and Kicelica, 2001). Girls are also more dissatisfied than boys with their changing body and more vulnerable to different stressors (Becker et al., 2007).

### **3.3. The relationship of non-suicidal self-injury and other suicidal behaviours**

Many theoretical models have been used to understand the relationships between non-suicidal self-injury, suicidal ideation, suicide attempts and suicide. Suicide is perhaps the cause of death most directly affected by psychological factors, because a person makes a conscious decision to end his or her life. Current evidence suggests that there are several different paths to suicidal behaviour, indicating that no one single theory can explain all heterogeneous forms of NSSI, SI, SA and completed suicide (Goldston et al., 2009; Hamza et al., 2012; O'Connor and Nock, 2014; Pelkonen et al., 2011).

The gateway theory suggests that NSSI and other suicidal behaviours exist on a continuum of self-injurious behaviours, with NSSI at one extreme and suicide at the other extreme (Hamza et al., 2012). NSSI may be a gateway of self-injury that leads to more extreme forms of self-injury with similar qualities to suicidal behaviour (Brausch and Gutierrez, 2010). Many research findings support the gateway theory. Recent research suggests that NSSI is a risk factor for future suicide attempts (Asarnow et al., 2011; Groholt et al., 2000; Nock et al., 2006; Wilkinson et al., 2011). The frequency of NSSI is predictive of the frequency and the lethality of SA (Prinstein et al., 2008; Whitlock et al., 2008) and NSSI tends to have earlier

age of onset than suicidal behaviour, suggesting that NSSI tends to precede suicidal behaviour developmentally (Muehlenkamp and Guertin, 2007; Ougrin et al., 2012). It seems that the onset of suicidal behaviour would be preceded by increasingly severe NSSI. In the Adolescent Depression Antidepressants and Psychotherapy Trial study (ADAPT), adolescents with major depressive disorder who had pre-baseline NSSI had a 10-fold greater risk of SA during treatment than those with no NSSI and reasonably good family functioning (Wilkinson et al., 2011). In addition, in the Treatment of Resistant Depression in Adolescents study (TORDIA) NSSI was a stronger predictor of future SA than SA itself (Asarnow et al., 2011).

According to the third variable theory, a third variable accounts for the co-occurrence of NSSI and other suicidal behaviours. Of people who die by suicide, 90% have a diagnosable psychiatric disorder (Cavanagh et al., 2003), and 87% of adolescent inpatients with NSSI had a psychiatric diagnosis (Nock et al., 2006). It thus seems that having a psychiatric disorder increases risk for NSSI and other suicidal behaviours (Nock et al., 2006). Another third variable that may similarly increase risk for both NSSI and other suicidal behaviours is perceived level of psychological distress. NSSI is often conceptualized as an emotion regulation strategy, suggesting that individuals engaged in NSSI are motivated to live but have difficulty coping with distress (Nock and Prinstein, 2004). The most common reason for NSSI is to relieve intense distressing affect (e.g. sadness, guilt, flashbacks) by the use of sharp physical pain, which can distract the sufferer from their unbearable feelings (Nock et al., 2006). While NSSI often results in short-term relief from distress, it frequently leads to long-term negative consequences. Despite awareness of the negative consequences when in a calm mood, it can be difficult to resist the strong urge to self-injury when angry or depressive feelings are intense, especially when self-injury has been rewarded in the past by reduction of distress (Wilkinson, 2013). Research has supported the third variable theory: adolescents with NSSI and other suicidal behaviours have had more depressive symptoms, suicidal ideation and lower perceived support from family (Asarnow et al., 2011; Muehlenkamp and Gutierrez, 2007; Wilkinson et al., 2011), therefore they have more distress than adolescents who do not engage in any self-injurious behaviour. In addition, the presence of some vulnerability factors (e.g. high negative affect, poor social skills) increases the likelihood that a person is diagnosed with a depressive, anxiety or externalizing disorder, and it is proposed that these disorders are associated with NSSI and other suicidal behaviours precisely because of intrapersonal or interpersonal dysregulation that leads to these diagnoses (Nock, 2010; Wilkinson, 2013).

Nock (2010) has presented the integrated theoretical model of the development and maintenance of self-injury to have three major propositions. First, self-injury is repeatedly performed because it functions as an immediately effective method of regulating the adolescent's cognitive and affective experience and influencing the adolescent's social environment in a desired way. Second, the risk of self-injury is increased by factors that create a predisposition to have problems regulating the adolescent's cognitive and affective state or influencing their social environment in general. These general risk factors also increase the likelihood of other maladaptive behaviours performed for the same function (e.g. alcohol use, drug use, eating disorders). Third, the risk of self-injury in particular is increased by several specific factors that lead the adolescent to choose this behaviour, rather than other maladaptive behaviours.

The interpersonal-psychological theory (Joiner, 2005) of suicidal behaviour presents understanding of the mechanisms that underlie death by suicide. The interpersonal-psychological theory holds that an individual will engage in serious suicidal behaviour if he or she has both the desire to die and the capability to act on that desire. The desire for death by suicide results from the confluence of two interpersonal states: perceived burdensomeness and thwarted belongingness. Perceived burdensomeness refers to the potentially dangerous misperception that the self is so incompetent that one's existence is a burden to friends, family members and society. The feeling to be a burden to others may lead to the potentially dangerous belief that one's death is worth more than one's life. Relatedly, feeling alienated from friends, family or other valued social circles, thwarted belongingness is also a risk factor for developing the desire for suicide. Although both states are independently associated with elevated risk for developing the desire for suicide, risk is greatest when both states are experienced concurrently. Thus, the theory holds that an individual must have the capacity to do so. The theory proposes that it is only the convergence of all three factors: perceived burdensomeness, thwarted belongingness and the acquired capability to engage in lethal self-injury that is sufficient to result in serious suicidal behaviour. Acquired capability comprises reduced fear of death and increased tolerance for physical pain. Longitudinal studies demonstrate that NSSI is associated with SA and provides partial support for this theory (Wilkinson et al., 2011). The capability for suicide is by having attempted suicide in the past. An estimated 804 000 suicide deaths occurred worldwide in 2012 (World Health Organization, WHO, 2014). The number of individuals who attempt suicide is at least twenty times greater than the number of deaths by suicide (WHO 2014). History of NSSI

and NSSI frequency were associated both with the presence of SA and the number of SA among inpatient adults (Andover and Gibb, 2010). In addition, patients with a history of NSSI reported higher levels of lethal intent for their most severe SA than those without a NSSI history (Andover and Gibb, 2010). These findings support Joiner's hypothesis that the habituation necessary to die by suicide may be acquired through experience with NSSI (Andover and Gibb, 2010).

In addition to Joiner's interpersonal theory there is another theory of being able to make predictions about the transitions to suicidal ideation and from suicidal ideation to self-injurious behaviour or death. The integrated motivational-volitional model of suicidal behaviour (O'Connor, 2011) conceptualizes suicide as a behaviour that develops through motivational and volitional phases (O'Connor and Nock, 2014). The motivational phase describes the factors that govern the development of suicidal ideation and intent, whereas the volitional phase outlines the factors that determine whether an individual attempts suicide. Whereas belongingness and burdensomeness are paramount in the final common pathway to suicide in the interpersonal theory (Joiner, 2005), feeling defeated after triggering circumstances and entrapment (ie, unable to escape from stressful, humiliating, or defeating circumstances) are posited to be of most importance within the integrated motivational-volitional model. When an individual feels both defeated and trapped, the likelihood that suicidal ideation will emerge increases when motivational moderators (eg, low levels of social support) are present. The integrated motivational-volitional model draws on the research done by Williams and others (Williams, 1997) into social-rank theory, the cry-of-pain and arrested-flight hypotheses, the differential activation hypothesis, and the theory of planned behaviour. Whereas the interpersonal theory of suicide posits that acquired capability establishes behavioural enactment (ie, suicide attempts), it is just one of several (volitional phase) factors within the integrated motivational-volitional model posited to increase the likelihood of self-harming behaviour. Such factors include exposure to the suicidal behaviour of others, impulsivity, and having access to the means of suicide. Although the integrated motivational-volitional model is new, empirical evidence supports its usefulness (O'Connor and Nock, 2014).

These theories give an understanding why it is important to identify NSSI and understand it as a part of the spectrum of suicidal behaviours. Because SA is a frightening action, most adolescents lack the ability to engage in suicide attempts. A negative side effect of engagement of NSSI may be that adolescents become habituated to the fear and physical pain associated with self-injury, thus acquiring the capability to perform lethal self-injury (Joiner, 2005). As only a minority of

people who have suicidal ideation actually attempt suicide, it may be that the presence of NSSI is a marker for crossing the boundary between ideas and suicidal acts (Wilkinson, 2013). Most studies to date have not been large enough to determine predictors for completed suicide, but SA is the strongest risk factor for future suicide in adolescents (Bridge et al., 2006). Therefore, NSSI is likely to be a predictor of completed suicide, adding to the evidence that this behaviour is clinically important (Wilkinson et al., 2011; Wilkinson, 2013).

## 4. Depression and suicidality in adolescents

### 4.1. Depression and non-suicidal self-injury, suicidal ideation and suicide attempts

Although the association between NSSI and depressive disorders has been little studied (Asarnow et al., 2011; Brent et al., 2011; Muehlenkamp and Gutierrez, 2004; Wilkinson et al., 2011), it seems prevalent in depressed adolescents. In the Adolescent Depression Antidepressants and Psychotherapy trial (ADAPT) study 37%, and in the Treatment of Resistant Depression in Adolescents (TORDIA) study 47% of depressed adolescents had non-suicidal self-injury (Asarnow et al., 2011; Wilkinson et al., 2011). Depressive disorders were found in 48-56% of adolescents who attended psychiatric services after self-injury with or without suicidal intent, defined as deliberate self-harm (DSH) in these studies (Burgess et al., 1998; Harrington et al., 2006). Depression may be as prevalent among adolescents with NSSI as among those who have attempted suicide (Muehlenkamp and Gutierrez, 2007). Besides diagnosed depressive disorders, adolescents with DSH (suicidal and non-suicidal self-harm) have high levels of depressive (Haavisto et al., 2005; Hawton et al., 2002; Ross and Heath, 2002) and anxiety symptoms (Haavisto et al., 2005; Ross and Heath, 2002) in community samples. Depression also seems important in the course of DSH (suicidal and non-suicidal self-harm), since rates of depression distinguished adolescents with DSH who self-harmed in adulthood from those who did not in a prospective cohort study (Harrington et al., 2006).

Depressive disorders are also the strongest risk factor for suicidal ideation and suicide attempts in adolescents (Aalto-Setälä et al., 2002; Beautrais, 2003; Fergusson et al., 2003; Goldston et al., 2009). Estimates of the prevalence of any suicidality in

depressed adolescent outpatients have varied from 25% to 66% (Liu et al., 2006; Pelkonen et al., 1997). The prevalence of SA has varied from 20% to 39% in adolescent outpatients with major depression (Asarnow et al., 2011; Pelkonen et al., 1997). Major depressive disorder was associated with the greatest contemporaneous risk for SA, after controlling for the presence of other disorders among previously hospitalized adolescents, in a follow-up study from adolescence to young adulthood (Goldston et al., 2009). In addition, major depressive disorder is the most common single disorder, present in 35% of suicides (Cavanagh et al., 2003). Approximately 50-75% of adolescent suicide victims have suffered from a mood disorder, most commonly major depression (Pelkonen et al., 2011).

#### **4.2. Depression with comorbidity and non-suicidal self-injury, suicidal ideation and suicide attempts**

While depressive disorders are among the most powerful predictors of SI and SA in adolescents (Beautrais, 2003; Evans et al., 2004; Goldston et al., 2009; Lewinsohn et al., 1996), the risk of SI, SA and NSSI further increases when depression is comorbid with disruptive behaviour, substance use and anxiety (Esposito and Clum, 2003; Foley et al., 2006; Gould et al., 2003; Klerk et al., 2011; Liu et al., 2006).

Anxiety disorders are the most common comorbid disorders in adolescent depression, but research on their significance for suicidal behaviour seems inconsistent. Comorbid anxiety disorders in adolescent depressive disorders have been associated with increased SI and SA in community samples (Esposito and Clum, 2003; Ghaziuddin et al., 2000). On the other hand, clinical studies have reported anxiety disorders not to be risk factors for SA whether comorbid or not (Beautrais, 2003; Strauss et al., 2000). In the ADAPT study of depressed adolescents, anxiety disorders predicted NSSI but not SA during follow-up (Wilkinson et al., 2011).

In the follow-up study by Goldston et al. (2009) with adolescents and young adults who had been hospitalized after SA, the risk of SA increased 2.5-fold in the presence of comorbid psychiatric disorders. Depression was present in almost 90% of adolescents with SA who had comorbid disorders. The relationship between SA and major depressive disorder, generalized anxiety disorder, attention-deficit hyperactivity disorder and substance use disorder strengthened from adolescence through young adulthood (Goldston et al., 2009). This strengthening of an association between SA and major depression and substance use disorders is of particular

concern, given the increasing rates of these disorders from adolescence to young adulthood (Goldston et al., 2009).

One explanation of the inconsistent findings may be that some disorders are correlated with SI, SA and NSSI because they are comorbid with depression, which is independently associated with all kinds of suicidality (Nock et al., 2013). Another explanation may be the different study sample characteristics. Outpatient and inpatient samples have more comorbidity than general population or student samples, whether they are suicidal or not. Much of the association between psychiatric disorders and SA may also be explained by factors common to most disorders and suicidal behaviour, such as experience of distress or impairment (Nock, 2010; Nock et al., 2013). These findings highlight one potential pathway through which mental disorders may lead to suicidal behaviour. The presence of multiple disorders is associated with higher levels of distress.

#### **4.3. Other risk and protective factors to non-suicidal self-injury, suicidal ideation and suicide attempts**

Most adolescents with depressive disorders do not develop suicidal behaviour, suggesting the presence of other factors that influence the vulnerability or resilience of adolescents to developing suicidal behaviour when depressed. It may be proposed that depressed adolescents who have NSSI, SI or SA are characterized by the presence of other social, family or individual risk factors.

Fergusson et al. (2003) studied vulnerability and resiliency to SI and SA among adolescents who developed depressive disorders using a birth cohort gathered over 21 years. Vulnerability or resiliency to the development of suicidal behaviour in depressed adolescents was an accumulative process of family history of suicidal behaviour, childhood sexual abuse, personality factors and the nature of adolescent peer relationships (Fergusson et al., 2003). Positive structure of these factors leads to increased resiliency, whereas negative structure leads to increased vulnerability (Fergusson et al., 2003). In that study of depressed adolescents with high vulnerability, almost two-thirds developed SI and one-third made SA, while less than one-quarter of adolescents with high resiliency developed SI and less than 5% made SA (Fergusson et al., 2003).

Indeed, adolescents with suicidal behaviour have been characterized by poor parental care and unhappy family circumstances; they lack formal educational qualifications, are poorer, use alcohol and have affiliations with deviant peers (Asarnow et al., 2011; Fergusson et al., 2003; Prinstein et al., 2001; Wilkinson et al., 2011). In addition, family structure, parental divorce, severe illness of a parent and living apart from parents are associated with DSH (with and without suicidal intent) both in community-based (Haavisto et al., 2005; Mittendorfer-Rutz et al., 2004) and clinical studies of adolescents (Beautrais, 2001).

Negative life-events are risk factors for NSSI and SA (Beautrais, 2003; Haavisto et al., 2005). In the school-based study in seven European countries negative life-events were associated with DSH (with or without suicidal intent) (Madge et al., 2011). In this study adolescents with DSH had experienced suicide or self-harm of others, physical or sexual abuse, difficulties with friends or peers and problems with or between parents (Madge et al., 2011). In the TORDIA study, depressed adolescents who had NSSI and SA also commonly had history of physical or sexual abuse (Asarnow et al., 2011).

Suicidal adolescents in community studies have had fewer supportive adults and more commonly unsupportive parents than non-suicidal adolescents (Evans et al., 2004; Madge et al., 2011). Adolescents with psychiatric disorders also have poorer relationships with their parents than healthy controls and receive less parental caretaking during their childhood (Laukkanen et al., 1998; Dieserud et al., 2010). Lack of family support and acceptance are also associated with greater severity of adolescents' depressive symptoms and suicidal ideation among inpatients (Beautrais et al., 1996; Kerr et al., 2006) and outpatients (Cumsille and Epstein, 1994; Perkins and Hartless, 2002). Both non-clinical and out- and inpatient adolescents with NSSI are reportedly less able to talk to family members or to seek support from their parents compared with their peers (Evans et al., 2004; Groholt et al., 2000). In the ADAPT study, poor family functioning was a risk factor for future SA in depressed adolescents, whereas problems in personal friendships were not (Wilkinson et al., 2011). In the TORDIA study, depressed adolescents with SA and NSSI had significantly more family conflict than adolescents with SA or NSSI only (Asarnow et al., 2011). In addition, in depressed adolescents, low support from family continues to predict suicidality in adulthood (Lewinsohn et al., 2001).

As peers have an increasing influence during adolescence it is not surprising that failure to develop adequate peer relationships has been associated with depression. In the study by Evans et al. (2004), non-clinical adolescents with NSSI

had fewer people whom they felt able to talk to about things that really bothered them compared to their peers (Evans et al., 2004). Furthermore, adolescents with psychiatric disorders had fewer peer relationships than healthy controls (Laukkanen et al., 1998). Close friendship support, perceived peer acceptance and rejection and deviant peer crowd affiliation appeared to contribute either directly or indirectly to suicidal ideation severity among adolescent inpatients (Prinstein et al., 2001). Approximately one-third of adolescents who attempt suicide, report interpersonal concerns (e.g. isolation from peers, lack of supportive friendships) as precipitants to suicidal behaviour (Hawton et al., 1996; Prinstein et al., 2001). This is in line with studies using clinical and general population samples, which have found an association between social isolation and SA (Prinstein et al., 2000; Prinstein et al., 2001).

Higher depressive symptoms during follow-up are associated with greater risk of NSSI (Cox et al., 2012; Nock et al., 2006; Wilkinson et al., 2011). In addition, adolescents with SI and SA have higher levels of depressive symptoms compared to non-suicidal adolescents during follow-up (Liu et al., 2006; Windle, 2004). Besides diagnosed anxiety disorders, previous research suggests that symptoms of anxiety are also associated with suicidal behaviour (Esposito et al., 2003; Foley et al., 2006; Ghaziuddin et al., 2000; Madge et al., 2011).

Heavy alcohol use increases the risk of acts of NSSI (Haavisto et al., 2005; Haw et al., 2005; Laukkanen et al., 2013). Reportedly, one-third of adolescent psychiatric inpatients with a history of NSSI had a diagnosis of alcohol abuse or alcohol dependence (Nock et al., 2006). In addition, alcohol misuse was a risk factor for suicide after NSSI among adolescents who were patients after NSSI in emergency departments in a follow-up study (Cooper et al., 2005). Likewise alcohol intoxication and alcohol problems were associated with SA in a community sample of adolescents (Swahn and Bossarte, 2007; Wichtröm, 2000; Windle, 2004), adolescent outpatients (Rosenberg et al., 2005; Skarbo et al., 2006) and among adolescents receiving treatment in inpatient and residential settings (Kelly et al., 2001). Moreover, there was no group difference in respect to alcohol problems in the follow-up period among psychiatric adolescent suicide attempters with or without intent to die (Skarbo et al., 2006).

Although suicidal behaviour has been a significant predictor of future depression and substance use disorders (Fergusson et al., 2003), many studies that examine the risk of suicidal behaviour among adolescents who misuse alcohol fail to control for depressive mood. In the study of adolescents living in the community, adolescents with depressive disorder without binge drinking and adolescents with depressive

disorder and binge drinking were at risk for suicidal ideation or suicide attempt, while binge drinking alone was not a risk for suicidal behaviour (Archie et al., 2012). Among inpatient adolescents alcohol use did not differentiate non-suicidal adolescents from adolescents with SI, but severity of depressive mood did (McManama O'Brien et al., 2013). Alcohol use may contribute to increased distress and depression, which may heighten the risk for a suicide attempt, or adolescents with poor distress tolerance, may be more likely to resort to alcohol use and suicidal behaviour to cope with their problems (McManama O'Brien et al., 2013).

Adolescents who are depressed but do not have suicidal behaviour are characterized by factors that protect them from suicidality. Support from parents and peers have been protective factors to NSSI, SI and SA and release their resiliency to suicidal behaviour (Fergusson et al., 2003). It has been suggested that social support from family and social connectedness may decrease risks of suicidal behaviour (Daniel and Goldston, 2009; Fergusson et al., 2003; Lewinsohn et al., 1993). Although the significance of family as a support source decreases during the adolescent development, social support from parents seems to have the most efficient effect in buffering adolescents against depression (Lewinsohn et al., 2001). In addition, support from peers has been related to less severe depression and suicidal ideation (Cumsille and Epstein, 1994; Prinstein et al., 2000).

## 5. AIMS OF THE STUDY

The main objective of this study was to analyse the prevalence, clinical risk factors and course of non-suicidal self-injury, suicidal ideation and suicide attempts among depressed adolescent outpatients at baseline and during a 12-month follow-up. In addition the aim was to study how growing up to young adulthood influences non-suicidal self-harm and suicide attempts, and to analyse how protective and risk factors change when adolescents grow older.

The specific aims of this study were:

1. To study the prevalence, gender and age differences and associated clinical characteristics of non-suicidal self-harm, suicidal ideation and suicide attempts among adolescent outpatients suffering depressive disorders (Study I).
2. To study whether depressed adolescent outpatients with non-suicidal self-harm differ from non-suicidal depressed adolescent outpatients with depressive and anxiety symptoms, perceived social support, negative life-events and alcohol use (Study II).
3. To study whether and how depressed adolescents with non-suicidal self-harm, suicidal ideation and suicide attempts differ from non-suicidal depressed adolescents in clinical risk factors during a 12-month follow-up (Study III).
4. To study non-suicidal self-harm and suicide attempts as short- and long- term predictors of future non-suicidal self-harm and suicide attempts, and to analyse how other risk and protective factors influence future suicidality from adolescence to young adulthood (Study IV).

## 6. METHODS

### 6.1. Procedure

This study is part of the Adolescent Depression Study (ADS), a collaborative study between the Department of Adolescent Psychiatry, Peijas Medical Health Care District (PMCD) of Helsinki University Central Hospital and the Department of Mental Health and Substance Abuse Services, National Institute for Health and Welfare, Helsinki, Finland. Data were obtained by interviewing the adolescents themselves and collecting additional background information (e.g. data from family and school) from clinical records. A written informed consent was obtained from the subjects. For subjects less than 18 years old, consent was also asked from parents or other legal guardians. The study protocol has been accepted by the Ethics Committees of Helsinki University Central Hospital and PMCD.

### 6.2. Subjects

The outpatient sample of the ADS study was drawn from the adolescent psychiatric outpatient clinics of the PMCD between February 1st 1998 and December 31st 2001. Of the 744 consecutive outpatients, 660 (85.3%) were considered eligible (Fig.1). The exclusion criteria were age below 13 or over 19 years, mental retardation, insufficient knowledge of the Finnish language or admission including no individual appointments. Of the eligible outpatients, 624 (94.5%) were screened during their first consultation visit with the Beck Depression Inventory (BDI-21) (Beck et al., 1961) and the General Health Questionnaire (GHQ-36) (Goldberg, 1972).

The 373 patients with scores of 10 or more in the BDI-21 and 5 or more in the GHQ-36 were considered screen positive and asked to participate in the study. At this point 118 (31.6%) outpatients refused and 34 (9.1%) dropped out. Refusal/dropping out was unrelated to sex ( $\chi^2=2.08$ ,  $df=1$ ,  $p=0.15$ ), age group ( $\chi^2 =2.37$ ,  $df=1$ ,  $p=0.12$ ) and parental SES (1= working class, 2= lower middle class, 3= upper middle class, 4=other) ( $\chi^2 =5.59$ ,  $df=3$ ,  $p=0.13$ ), while it associated with lower BDI-21 (19.0 vs. 21.0,  $z=-1.93$ ,  $df=371$ ,  $p=0.05$ ) and lower GHQ-36 (21.0 vs. 24.0,  $z=-1.98$   $df=367$ ,  $p=0.05$ ) median sum scores (Karlsson et al., 2006). The 221 remaining outpatients were evaluated by diagnostic interview (Schedule for Affective Disorders and Schizophrenia for School-Aged Children – Present and Life-time, K-SADS-PL) (Kaufman et al., 1997), and the 218 diagnosed with a current depressive mood disorder formed the original adolescent outpatient study population. The subjects' mean age was 16.4 (SD 1.6, range 13-19 years), 18% ( $n=40$ ) were males and 82% ( $n=178$ ) females.

In all, 72% ( $n=157/218$ ) had one or more Axis I disorder in addition to a mood disorder. Comorbidity with anxiety disorders ( $n=125$ , 57%) was most common, with 20% ( $n=43$ ) of the subjects having an anxiety disorder plus at least one other comorbid disorder. Fifteen percent ( $n=32$ ) had other comorbidity: substance use disorder ( $n=18$ , 56.2%), eating disorder ( $n=6$ , 18.8%), disruptive disorder ( $n=12$ , 37.5%). Comorbidity was unrelated to parental SES (1=working class, 2 = lower middle class, 3=upper middle class, 4=other) ( $\chi^2=7.823$ ,  $df =9$ ,  $p=0.552$ ).

During the past year 34% had used drugs once or more often and 60% of adolescents smoked regularly.

### 6.2.1. Subjects in Study I and Study II

In Study I, the 218 subjects were classified into four groups according to psychiatric comorbidity: 1. subjects with depressive disorder without comorbidity, 2. subjects with a depressive disorder and an anxiety disorder, 3. subjects with a depressive disorder, an anxiety disorder and other comorbid disorders and 4. subjects with a depressive disorder and other comorbid disorders excluding anxiety disorders.

Subjects of Study II ( $n=155$ ) consisted of patients with DSH ( $n=73$ ) and patients with no suicidality ( $n=82$ ). Of the 218 depressed outpatients, 47 were excluded from the analyses due to suicidal thoughts ( $n=33$ ) or previous suicide attempts ( $n=14$ ), but with no DSH during the current depressive episode. Further, 16 outpatients

were excluded from the non-suicidal group due to suicidality in an earlier depressive episode. There were no differences in comorbidity between depressed adolescents with DSH and non-suicidal depressed adolescents ( $\lambda^2=0.990$ ,  $df=1$ ,  $p=0.320$ ) or between different kinds of comorbidity.

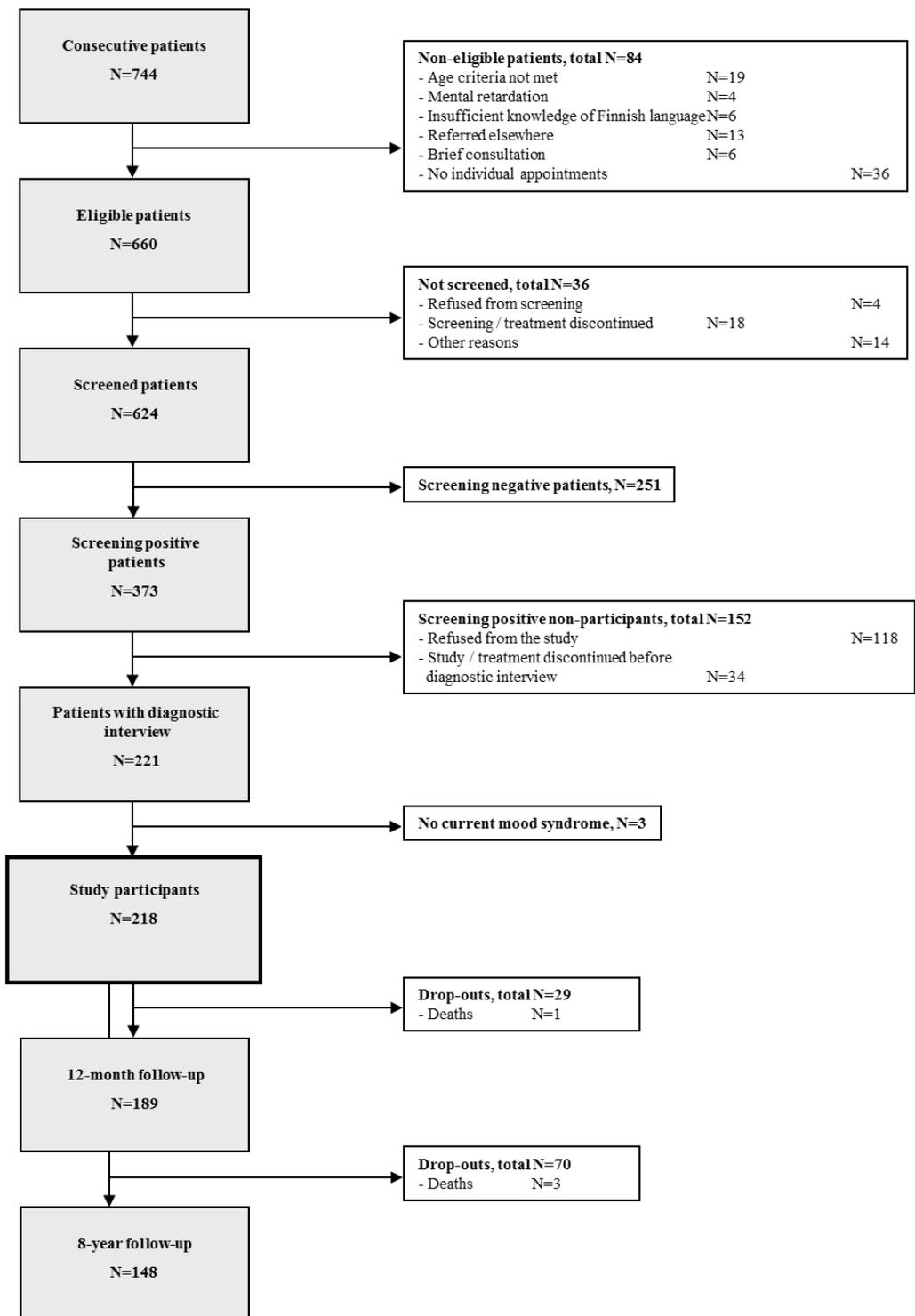
### 6.2.2. Subjects in Study III and Study IV

Of the entire ADS study population, those with diagnostic interview data available at one-year follow-up re-evaluation were included in Study III ( $n=189$ ) (Fig 1). Those lost to attrition between baseline and follow-up re-evaluation ( $n=29$ , 13.3%) did not differ from those retained to the follow-up in terms of the central sociodemographic factors (sex  $\chi^2=0.027$ ,  $df=1$ ,  $p=0.869$ , age  $z=-0.505$ ,  $p=0.613$ , parental SES  $\chi^2=7.465$ ,  $df=2$ ,  $p=0.058$ ).

Subjects of Study IV ( $n=139$ ) consisted of those 137 subjects who participated at baseline, one-year and eight-year follow-ups and two subjects who committed suicide (a female victim before and a male victim after one-year follow-up) during the eight-year study period. Data on these subjects were included in the analyses when possible. Those lost to attrition ( $n=79$ , 36%) did not differ from the study participants ( $n=139$ ) in terms of sociodemographic factors (sex  $\chi^2=0.033$ ,  $df=1$ ,  $p=0.857$ , age  $t=-1.188$ ,  $df=216$ ,  $p=0.236$ , parental SES  $\chi^2=2.78$ ,  $df=3$ ,  $p=0.426$ ), depressive symptoms (BDI-sumscore  $t=-1.469$ ,  $df=216$ ,  $p=0.143$ ), or prevalence of SA ( $\chi^2=1.089$ ,  $df=1$ ,  $p=0.297$ ) or NSSI ( $\chi^2=0.213$ ,  $df=1$ ,  $p=0.644$ ) at baseline.

### 6.3. Treatment received

As the ADS was naturalistic, the subjects received “treatment as usual” of clinically defined duration in a general adolescent psychiatric setting of Finnish secondary health care (Karlsson et al., 2008). When they were 19 years old, they were able to contact adult psychiatric services if they needed psychiatric treatment. During the one-year follow-up, 51% of the subjects received only individual psychotherapy, 49% at least one session of family counselling and 54 % of the 189 adolescents received psychotropic medication. Thirty-three (17%) of the 189 subjects had been in psychiatric inpatient treatment by the one-year follow-up. After one year of follow-up, 46% of the 189 outpatients continued their treatment. During follow-up



**Figure 1.** Flow chart of the Adolescent Depression Study (ADS) population.

from one to eight years, 80% of the 139 subjects received individual appointments and 62 % psychiatric medication. Twenty-five (19%) of the 139 subjects had been in psychiatric inpatient treatment between the one-year and eight-year follow-ups.

#### 6.4. Diagnostic assessment

Nine researchers, also experienced clinicians, conducted diagnostic interviews of the screen positive patients. K-SADS-PL, a semi-structured interview with high reliability and validity (Kaufman et al., 1997; Shanee et al., 1997), was used to assess DSM-IV Axis I disorders. All the research diagnoses were confirmed in a subsequent diagnostic meeting at baseline. Inter-rater reliability, assessed using 15 randomly selected videotaped interviews, was good for mood disorder diagnoses weighted kappa (Fleiss and Cohen, 1973; SAS Institute Inc., 1999) for MDD, other mood disorder, no mood disorder 0.87 (95% CI 0.81,0.93) (Karlsson et al., 2006). Patients were classified as suffering a comorbid psychiatric disorder if they had one or more non-affective Axis I diagnosis in addition to the depressive mood disorder. DSM-IV Axis II disorders were diagnosed using the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II) (First et al., 1996). In all, 218 subjects received a current depressive mood disorder and formed the original adolescent outpatient study population.

After the baseline evaluation the adolescent outpatients were re-evaluated approximately one year (n= 189) later with K-SADS-PL and SCID-II interviews. The median time interval between baseline and follow-up evaluation was 12.5 months (interquartile range 0.9) for one-year follow-up.

At eight-year follow-up, adolescent outpatients were re-evaluated with Structured Clinical Interview for DSM-IV Axis-I disorders, SCID-I (First et al., 1996) and SCID-II (n=148). The median time interval for one-year and eight-year follow-up was 97.4 months (interquartile range 18.3).

Psychosocial functioning (Global Assessment of Functioning, GAF) was assessed according to the DSM-IV Axis V definitions (APA 1994). A GAF rating score from 1 (most impaired) to 100 (least impaired) was assigned, with descriptors provided for each 10-point interval. To determine the rating, the researcher selected the 10-point interval that best described the patient's functioning and then used his or her judgment to assign an exact rating within that interval. In data analyses, the GAF score was treated as a continuous variable.

The time of onset of a disorder was identified as the time point when the minimum requirements for each DSM-IV diagnosis were simultaneously present. Probing questions were used to obtain the best possible accuracy. The duration of the current depressive disorder was calculated as the number of months the current depressive episode had persisted prior to the screening date. In data analyses, the time of onset and duration of the current depressive disorder were treated as continuous variables.

Mood disorder during one-year follow-up time was defined as suffering from continuing depression between the baseline and follow-up re-evaluation or having recurrent depression during one-year follow-up. Recurrence was defined as a new depressive episode between baseline and follow-up re-evaluation.

## **6.5. Assessment and classification of suicidality**

### **6.5.1. Assessment and classification of suicidality at baseline**

Suicidal behaviour was determined using four questions from the screening section of the K-SADS-PL diagnostic interview relating to suicidal thoughts (rating “1” = none, “2” = occasional, “3” = frequent), suicide attempts and their seriousness (rating “1” = none, “2” = ambivalent, “3” = serious), suicide attempts and their lethality (rating “1” = none, “2” = not life-threatening, “3” = life-threatening) and non-suicidal physical self-damaging acts (rating “1” = none, “2” = occasional, “3” = frequent).

In Study I, based on these questions, four mutually exclusive subgroups of suicidal behaviour were constructed: 1) subjects who coded “1” or “2” in all items were coded as “non-suicidal”, 2) “suicidal ideation” consisted of subjects who had suicidal thoughts frequently (rating “3”) but had not attempted suicide, 3) the “deliberate self-harm behaviour” group included subjects who had frequent non-suicidal self-harm (rating “3”) and 4) the “suicide attempts” group consisted of adolescents who had made one or more serious (rating “3”) or life-threatening (rating “3”) suicide attempts. Suicidal behaviour was coded according to the most serious behaviour reported. Thus, an adolescent with both deliberate self-harm behaviour and suicide attempt was classified in the “suicide attempt” group, and an adolescent with both suicidal ideation and DSH was classified in the “DSH” group.

In Study II, based on these same four questions about suicidality, two mutually exclusive outpatient subgroups of suicidal behaviour during the current depressive episode were constructed: 1) the “deliberate self-harm behaviour” group includ-

ed subjects who had occasional (rating “2”) or frequent (rating “3”) non-suicidal self-harm. Seventy-three (34%) of the 218 depressed adolescent outpatients were included in this DSH group; 2) the “non-suicidal” group consisted of subjects with no current or previous suicidality rating “1” in all items (n= 82). Of the baseline sample, 63 subjects were excluded from the analyses due to current suicidal thoughts (n=33), or previous suicide attempts (n=14) or suicidality in an earlier depressive episode (n=16). In Study II the deliberate self-harm behaviour group (n=73) was further divided into two subgroups: 1) adolescents with “deliberate self-harm only” included those with no suicidal thoughts and who had not attempted suicide (n=21), 2) adolescents with “deliberate self-harm behaviour and suicidal ideation or suicide attempt” consisted of adolescents who had DSH and suicidal thoughts frequently (n=14), or had attempted suicide (n=38).

### ***6.5.2. Assessment and classification of suicidality during follow-ups***

Suicidal behaviour was determined using the same four questions as in Studies I and II from the screening section of the K-SADS-PL diagnostic interview. In Study III, based on these questions, two outpatient subgroups of suicidal behaviour during the one-year follow-up were constructed: 1) the “non-suicidal” group consisted of subjects with no suicidality during the follow-up, rating “1” in all items (n= 122), 2) the “suicidal adolescents” group consisted of subjects with suicidal ideation (rating “2” or “3”), DSH (rating “2” or “3”), or adolescents who had made one or more suicide attempts (rating “3” serious, “2” not life-threatening or “3” life-threatening) (n=67) during the follow-up.

From the group of suicidal adolescents a subgroup (“DSH”) was formed consisting of adolescents who had occasional or frequent DSH (rating “2” or “3”) during follow-up (n=45). Of adolescents who had DSH, 40% (n=18) had only DSH, 19% (n=8) DSH and suicidal ideation and 41% (n=19) DSH and suicide attempts.

In Study III, continuing suicidality was also studied. At baseline, 105 adolescents were suicidal and 56 of them were suicidal during follow-up, and were classified as having continuing suicidality. The “suicidal adolescents” group consisted of subjects with suicidal ideation (rating “2”, occasional or “3”, frequent), DSH (rating “2”, or “3”), or adolescents who had made one or more suicide attempts during the follow-up. The outcome variable “suicidal behaviour during follow-up” included suicidal behaviours at any time during follow-up and/or at the time of follow-up interview.

In Study IV, suicidal behaviour was assessed using the same four questions as in Studies I-III from the screening section of the K-SADS-PL diagnostic interview. Suicide attempt (SA) was defined as an attempt with seriousness rating “3” and/or lethality rating “2” or “3”. NSSI was defined as direct and deliberate destruction of body tissue in the absence of any observable intent to die (Nock, 2010). NSSI was assessed by K-SADS-PL question “Non-suicidal Physical Self-Damaging Acts” and those rated as having occasional (rating “2”) or frequent (rating “3”). For the analyses SA and NSSI variables were constructed for baseline (referring to current depressive episode), for the follow-up period from baseline to one year (during short-term follow-up) and for the period from one- to eight years (during long-term follow-up).

### ***6.5.3. Assessment of psychiatric symptoms, alcohol use and perceived social support***

Depressive symptoms were assessed using the Beck Depression Inventory-21 (BDI-21) (Beck et al., 1961). The BDI-21 is a standardized 21-item questionnaire, a well-studied measure for youthful depression (Brooks and Kutcher, 2001; Myers and Winters, 2002). The adolescent was asked to rate how much he or she had been bothered by each symptom on a 4-point scale ranging from 0 (Not at all) to 3 (Severely) according to the severity of the symptom (sum score range 0-63).

Anxiety symptoms were assessed using the Beck Anxiety Inventory (BAI) (Beck et al., 1988). The Beck Anxiety Inventory is a 21-item self-report measure of anxiety symptoms, validated both in adults and adolescents (Beck et al., 1988). The adolescent was asked to rate how much he or she had been bothered by each symptom over the past week on a 4-point scale ranging from 0 (Not at all) to 3 (Severely) according to the severity of the symptom (sum score range 0-63).

Alcohol use was assessed using the Alcohol Use Disorders Identification Test (AUDIT) (Saunders et al., 1993), which has been shown to be a reliable and valid measure for alcohol use in adolescents (Reinert and Allen, 2002; Santis et al., 2009). AUDIT is a 10-item questionnaire which covers the domains of current alcohol consumption, drinking behaviour and alcohol-related problems (sum score range 0-40).

Social support was assessed by the Perceived Social Support Scale-Revised (PSSS-R) (Blumenthal et al., 1987), a self-report scale consisting of 12 items rated on a five-point Likert-type format ranging from totally disagree (1) to totally agree (5). Previous research on the PSSS-R has identified three separate but correlated fac-

tors addressing perceived support from family (range 0-20), from a significant other (range 0-20) and from friends (0-20). The PSSS-R has demonstrated good internal reliability and adequate stability both in adults (Blumenthal et al., 1987) and in adolescents (Ritakallio et al., 2010). A higher score indicates higher level of perceived social support. In Study II all three subscales were used, and in Study IV perceived social support was assessed using the family and friend subscales of the PSSS-R.

Life-events were assessed using a modified version of the Life-events Checklist (LEC) (Johnson and McCutcheon, 1980), a self-report questionnaire relating to events experienced during one's lifetime and during the past year. The respondent rates whether or not the event occurred, and whether its impact was positive or negative. The scale has been shown to have sound psychometric properties (Johnsson and Sarason, 1979). In Study II the number of negative life-events during the previous year (range 0-26) was used in the analyses.

All self-report scales were administered both at baseline and at follow-ups. In data analyses the sum scores of the GAF, BDI-21, BAI, AUDIT, LEC, and the three PSSS-R sub-scales were treated as continuous variables.

## 6.6. Statistical analyses

In Studies I, II and III the group comparisons were analysed using the Chi Square and Fisher's Exact test. Non-parametric descriptive statistics were applied for non-normally distributed numerical variables (Kruskall-Wallis, Mann-Whitney U). Equality of the means was tested using the one-way analysis of variance (ANOVA). P-values < 0.05 and odds ratios (OR) with lower 95% confidence intervals (95% CI) >1 were considered statistically significant. Posthoc subgroup differences were compared using the Bonferroni procedure, with .05 as the level of significance in multiple comparisons.

In Study I, to analyse factors associating with different kinds of suicidal behaviour (dependent variable) and to find the most important predictors, a multivariate logistic regression analysis using a backward selection procedure was performed. Multivariate logistic regression analyses were conducted using a backward selection procedure for each of the suicidal behaviour groups (suicidal ideation only, DSH and suicide attempts) versus non-suicidal adolescents. All models were performed to simultaneously control the effects of comorbid Axis I disorders, age, gender, severity

of depression and anxiety symptoms, psychosocial functioning, age of onset of the first mood disorder episode and duration of the current mood disorder episode.

In Study II multivariate logistic regression analysis was performed, depressed adolescents with DSH as the dependent variable (depressed adolescents with DSH versus non-suicidal depressed adolescents). The significant variables in bivariate analyses were entered into the model.

In Study III, which studied alcohol use and psychiatric comorbid disorders as predictors of NSSI and other suicidal behaviour (suicidality vs. non-suicidality, DSH vs. non-suicidality, continuing suicidality vs. suicidality at baseline and non-suicidality during follow-up) during follow-up, logistic regression was used. These analyses were done first with one predictor variable at a time (bivariate) and then with all variables simultaneously in the model (multivariate). Variables used in bivariate analyses were checked for multicollinearity before they were entered into the multivariate analyses. Previous suicidality and the impact of mood disorders were controlled for in the multivariate analyses.

Study IV analysed predictors of suicide attempt and NSSI from baseline to one-year follow-up and from one- to eight-year follow-up. Predictors of SA and NSSI were analysed in two phases: 1) using baseline variables to predict SA and NSSI during one-year follow-up and 2) using variables from one-year assessment to predict SA and NSSI during the one- to eight-year follow-up. First, univariate analyses were done with one predictor variable at a time. Multivariate analyses were then done using hierarchical logistic regression and variables were entered into the regression equations in the following order: step 1) age and gender, SA, NSSI, step 2) depressive symptoms (BDI), anxiety symptoms (BAI), step 3) alcohol use (AUDIT) and step 4) perceived social support from family (PSSS-R family), and from friends (PSSS-R friends). Variables used in univariate analyses were checked for multicollinearity using variance inflation factors and condition indexes before they were entered into the multivariate analyses: there were no indications of serious multicollinearity among the predictor variables (Field 2005).

## 7. RESULTS

### 7.1 Suicidality among adolescent outpatients with depressive disorders and comorbid Axis I disorders (Study I)

Almost half (49%) of adolescent outpatients had a history of non-suicidal self-injury, suicidal ideation or suicide attempts at baseline. The prevalence of NSSI was 13%, SI was 19%, and 16% had attempted suicide. There were no gender differences in the types of suicidality ( $\chi^2=3.218$ ,  $df=3$ ,  $p=0.359$ ).

SI was more common among subjects aged 16-19 years (23%) compared to those aged 13-15 years (11%), while NSSI was more common among younger than older subjects (23% vs. 9%, respectively) (Study I, Table 1).

Neither age of onset ( $F=0.236$ ,  $df=3$ ,  $P=0.871$ ) nor duration of the current mood disorder episode were associated with the three suicidal behaviour groups or of having no suicidality ( $\chi^2=4.705$ ,  $df=3$ ,  $p=0.195$ ).

Adolescents with SI or SA had more depressive symptoms ( $p=0.001$ ,  $p=0.000$ , respectively) and lower psychosocial functioning ( $p=0.004$ ,  $p=0.000$ , respectively) than non-suicidal depressed adolescents. Adolescents with SA had more anxiety symptoms than non-suicidal adolescents ( $p=0.049$ ) (Study I, Table 1). No differences in the frequencies of NSSI, SI or SA were found between non-comorbid and comorbid depressive disorder groups, either by gender (males:  $\chi^2=3.635$ ,  $df=3$ ,  $p=0.304$ , females:  $\chi^2=5.197$ ,  $df=3$ ,  $p=0.158$ ) or age (13-15 years:  $\chi^2=0.238$ ,  $df=3$ ,  $p=0.971$ , 16-19 years:  $\chi^2=0.328$ ,  $df=3$ ,  $p=0.507$ ).

Multivariate regression analyses were conducted in order to find predictor variables associated with NSSI, SI and SA in comparison with non-suicidal depressed

adolescents (Study I, Table 3). Younger age and poor psychosocial functioning associated with NSSI. Depressive symptoms and poor psychosocial functioning associated with SI and depressive symptoms, poor psychosocial functioning and not having a depressive disorder comorbid with anxiety disorder associated with SA.

## **7.2. Factors associated with deliberate self-harm among adolescent outpatients with depressive disorders (Study II)**

No statistically significant differences in gender or in mean age between subjects with NSSI and non-suicidal subjects were found. Neither were there statistically significant age differences between adolescents with NSSI only, or with NSSI and SI or SA (Study II, Table 1).

Depressed adolescents with NSSI had significantly more depressive symptoms, used alcohol more, and had less perceived support from family compared with non-suicidal depressed adolescents (Study II, Table 1). No differences between the two groups were found in parental divorce, perceived support from friends or from significant others nor in number of negative life-events during the previous year. Three-quarters of females with NSSI (49 of 63) also had other suicidal behaviour, among males the proportion was 30% (3 of 10).

Depressed adolescents with both NSSI and SI or SA suffered from significantly more severe depressive and anxiety symptoms than depressed adolescents with only NSSI (Study II, Table 2). There were no significant differences in parental divorce, alcohol use, perceived support from family, friends or significant others, nor in negative life-events during the previous year between these two groups.

In multivariate logistic regression analyses, low level of perceived support from family, alcohol use, younger age and depressive symptoms all associated with NSSI (Study II, Table 3).

## **7.3. Prevalence and predictors of non-suicidal self-injury, suicidal ideation and suicide attempts during one-year follow-up (Study III)**

During one-year follow-up the proportion of adolescents with non-suicidal self-injury, suicidal ideation or suicide attempts declined from 56% (n=105) at baseline to 35% (n= 67).

During follow-up subjects with NSSI, SI or SA were more often females, had more severe depressive and anxiety symptoms, their psychosocial functioning was poorer and they used more alcohol. Suicidality at baseline and mood disorder during follow-up was also more common among them compared with non-suicidal depressed adolescents (Study III, table 1). In multivariate logistic regression analysis comorbid mood disorder, use of alcohol, suicidality at baseline and mood disorder during follow-up predicted NSSI, SI and SA during follow-up. (Study III, table 2).

During follow up, 24% of all depressed adolescents and 68% of suicidal subjects had NSSI. Subjects having NSSI during follow-up were younger, had significantly more severe depressive and anxiety symptoms, had poor psychosocial functioning, used more alcohol, were more often suicidal at baseline and had significantly more common mood disorders during follow-up compared with non-suicidal subjects. In multivariate logistic regression analysis comorbid mood disorder, use of alcohol, baseline suicidality and mood disorder during follow-up predicted NSSI during follow-up (Study III, Table 2).

At baseline, 105 adolescents were suicidal and 56 of them were continuously suicidal during the follow-up. Subjects with continuing suicidality (suicidal ideation, SA or NSSI) during follow-up were more often females, had significantly more severe depressive and anxiety symptoms, used more alcohol, and had significantly more often mood disorder during follow-up than adolescents whose suicidality vanished during follow-up. In multivariate logistic regression analysis being female, having comorbid mood disorder and having mood disorder during follow-up predicted continuing suicidality (Study III, Table 2).

#### **7.4. Prevalence and predictors of suicide attempts, and non-suicidal self-injury during an eight-year follow-up (Study IV)**

NSSI was found in 32% of the subjects at baseline, its proportion declined to 22% during the one-year follow-up and further to 16% at eight-year follow-up. The proportion of subjects with SA also dropped from 21% at baseline to 14% at one-year and 12% at eight-year follow-up (Study IV, Table 1). NSSI and SA were significantly associated at baseline ( $\chi^2=39.64$ ,  $df=1$ ,  $p=0.000$ ) and during the one-year follow-up ( $\chi^2=42.39$ ,  $df=1$ ,  $p=0.000$ ). NSSI at baseline preceded both suicides and the female participant also had SA at baseline.

SA and NSSI during one-year follow-up predicted SA during one-year follow-up in univariate analyses, as did depressive and anxiety symptoms and alcohol use. Baseline SA was a significant risk factor for SA in the first step of the hierarchical multiple regression analyses. Adding depressive and anxiety symptoms to the model did not have an impact on this, whereas after adding alcohol use to the model (in step three) the effect of SA at baseline attenuated to non-significant. In the final model (step 4) alcohol use and low perceived social support from friends predicted SA (Study IV, Table 2).

In univariate analyses SA and NSSI, alcohol use and low support from friends predicted SA from one- to eight-year follow-up while female sex appeared as a protective factor (Study IV, Table 3). In multivariate regression analysis male sex and NSSI were significant risk factors to SA in step one while SA was not. Adding depressive and anxiety symptoms in step 2 had no effect on this, but in step 3 when alcohol use was added to the model, the effect of NSSI was also attenuated to non-significant. In the final model (step 4) alcohol use and low perceived social support from friends were the only significant predictors of SA in the one- to eight-year follow-up (Study IV, Table 3).

Younger age, NSSI and SA at baseline, anxiety symptoms and alcohol use predicted NSSI during one-year follow-up in univariate analyses (Study 4, Table 4). In the different hierarchical multiple regression models NSSI at baseline predicted NSSI in every step of analyses (Study 4, Table 4). Alcohol use was also a significant predictor of NSSI when it was added to the model in step 3. In the final model when perceived social support from family and from friends were added to the model, younger age, NSSI and alcohol use at baseline predicted NSSI during one-year follow-up (Study IV, Table 4).

In univariate analyses NSSI, anxiety symptoms and alcohol use predicted NSSI from one- to eight- year follow-up. In hierarchical regression analysis NSSI was the only significant predictor of NSSI and adding other predictors to the model did not change its effect markedly: OR of 7.2 in step 1 dropped to 5.6 in the final model in step 4 (Study IV, Table 5).

## 8. DISCUSSION

This thesis studied non-suicidal self-injury, suicidal ideation and suicide attempts among depressed adolescent outpatients. The study was based on the Adolescent Depression Study investigating adolescents' mood disorders. The aim was to analyse the prevalence of NSSI, SI and SA and to study risk factors for NSSI, SI and SA among depressed adolescents at baseline and during one-year follow-up and NSSI and SA as predictors to future NSSI and SA during an eight-year follow-up.

### 8.1. Summary of the main findings

Using strict definition half of depressed adolescent outpatients showed different kinds of suicidality at baseline. Based on diagnostic classification only, no statistically significant differences were found in different forms of suicidality (NSSI, SI and SA) between non-comorbid and comorbid depressive disorders.

At baseline seventy-three (34%) of the 218 depressed adolescent outpatients had non-suicidal self-injury, 29% of them NSSI only, 19% NSSI and SI and 51% NSSI and SA. In comparison with non-suicidal depressed adolescents, low perceived support from family, alcohol use, younger age and depressive symptoms associated with NSSI at baseline.

The proportion of suicidal adolescents declined from 56% at baseline to 35% during one-year follow-up. A quarter of all depressed adolescents and two thirds of suicidal adolescents had NSSI during the follow-up. Comorbid disorders, alcohol use and suicidality at baseline predicted NSSI, SI and SA during one-year follow-up.

More than one half of the subjects were suicidal at baseline and in approximately half suicidality continued during one-year follow-up. Female gender and comorbidity significantly predicted continuing suicidality.

The proportion of adolescents with NSSI declined from 32% at baseline to 22% during the one-year and to 16% between the one-year and eight-year follow-ups. A declining trend was also observed in the prevalence of SA: 21% at baseline, 14% during the one-year and 12% between the one-year and eight-year follow-ups.

Alcohol use and low perceived social support from friends predicted SA both during one-year, and between the one-year and eight-year follow-ups. Younger age, NSSI and alcohol use at baseline predicted NSSI in the one-year follow-up, whereas NSSI was the only significant predictor of NSSI between the one-year and eight-year follow-ups.

Two subjects, one female, and one male committed suicide during the eight-year follow-up and both had NSSI at baseline and the female participant also had a history of SA at baseline.

## **8.2. Suicidality among adolescent outpatients with depressive disorders and comorbid Axis I disorders**

The prevalence in this study of any suicidality was slightly lower than in many studies in clinical samples (Kovacs et al., 1993; Pelkonen et al., 1997; Pelkonen and Marttunen, 2003). Consistent with the findings of this study, 47% of depressed adolescents had SA or NSSI in the TORDIA study (Asarnow et al., 2011), 38% had NSSI and 23% had attempted suicide. In another recent study of depressed adolescent outpatients (ADAPT, Wilkinson et al., 2011), 36% of the subjects had NSSI and 17% had attempted suicide at baseline. The lower prevalence of NSSI in this study may be due to the methodological decision to code suicidal behaviour according to the most serious behaviour reported. Because of that decision a subject with both NSSI and SA was classified only in the “suicide attempt”-group and therefore the prevalence of NSSI was lower.

Suicidal ideation was more common among adolescents aged 16-19 years compared to those aged 13-15 years, while NSSI was more common among younger than older subjects. The prevalence of NSSI increases from age 12 onwards (Hawton et al., 2012), while SI seems most common among older adolescents. The onset of

NSSI has reported to have its timing around puberty, between 12-15 years (Hawton et al., 2012).

Based on diagnostic classification only, no statistically significant differences were found in different forms of suicidal behaviour (SI, SA, NSSI) between non-comorbid and comorbid depressive disorders. Although comorbidity is common in adolescent depression, research on its significance for suicidal behaviour seems inconsistent. In other studies of depressed adolescent outpatients and inpatients the severity of depression has associated with suicidality whether the disorder was comorbid or not (Goldston et al., 1999; Wetzler et al., 1996). In a follow-up study of adolescents after psychiatric hospitalization (Goldston et al., 2009), 90% of the subjects suffering from comorbid disorders and attempted suicide had a depressive disorder suggesting that despite various diagnostic patterns, a common path in suicidal behaviour is depression. Many psychiatric disorders are correlated with SI or SA because they are comorbid with disorders like depression which is independently associated with all kinds of suicidality (Nock et al., 2013). The finding that comorbid anxiety disorders were not associated with suicide attempts seems consistent with findings in a national sample of adolescents and adults reporting that anxiety disorders were associated with low odds of all suicidal behaviour (Nock et al., 2010; Nock et al., 2013). Among adults anxiety disorder showed the largest decay in association with SA in the presence of comorbid disorders, suggesting that anxiety disorder was not uniquely associated with SA (Nock et al., 2010).

In addition, it is possible that much of the association between psychiatric disorders and SA is explained by factors common to many disorders, such as experience of distress or impairment (Nock et al., 2013). It seems possible that symptoms of anxiety are an expression of such distress and, therefore, were associated with suicide attempts in this study, as also in previous studies (Asarnow et al., 2011; Esposito and Clum 2002; Ghaziuddin et al., 2000; Wetzler et al., 1996).

### **8.3. Factors associated with non-suicidal self-injurious behaviour**

Depressed adolescent outpatients with NSSI used more alcohol than non-suicidal depressed adolescents as in previous research in non-clinical samples (Haavisto et al., 2005; Haw et al., 2005; Moran et al., 2012; Windle, 2004), and among suicidal adolescent outpatients (Windle and Windle, 1997). The finding also accords

with the result reported by Nock (2006) that one-third of adolescent psychiatric inpatients with a history of NSSI had a diagnosis of alcohol abuse or dependence. Brent et al. (2012) also found depressed adolescents who had a suicidal event after three months in treatment having had alcohol use at baseline.

The finding that adolescents with NSSI had less perceived support from family than those with no suicidality accords with previous reports that adolescents with NSSI have lower levels of familial adaptability and cohesion (Cox et al., 2012), and that family conflict and dysfunction associate with NSSI (Asarnow et al., 2011). The family is an important developmental context during adolescence and deficiency in family support has been a risk factor for depressive symptoms and SI in suicidal adolescent inpatients (Kerr et al., 2006). Furthermore, low support from the family predicts suicidality in adulthood in depressed adolescents (Lewinsohn et al., 2001). As in this study, the ADAPT study also found problems in personal friendships not to associate with subsequent NSSI (Wilkinson et al., 2011).

Depressed adolescents with NSSI and SI or SA had more severe depressive and anxiety symptoms than adolescents with only NSSI, in accord with the finding of TORDIA study that adolescents with NSSI and SA had higher levels of depressive symptoms than those with only NSSI or only SA (Asarnow et al., 2011). More severe depressive symptoms have associated with greater risk of NSSI among depressed adolescents (Wilkinson et al., 2011) and in a longitudinal study of youths with high risk for depression (Cox et al., 2012). One possible explanation is that continued depressive symptoms lead to NSSI as an attempt to regulate affects (Wilkinson et al., 2011). Finding higher levels of negative affect, including depressive and anxiety symptoms, is consistent with the most frequently cited function of NSSI which is to reduce tension or to interrupt negative emotional states (Cox et al., 2012; Nock and Prinstein, 2004; Wilkinson et al., 2011). Since the severity of depressive and anxiety symptoms may increase the risk of attempting suicide in adolescents with NSSI, adolescents experiencing significant internalized distress symptoms are at risk not only for NSSI, but also for additional suicidal behaviour. According to the interpersonal-psychological theory of suicidal behaviour (Joiner 2005) practising NSSI over time habituates an individual to self-harm, a mechanism which increases the risk for SA because of habituation to the fears and physical pain associated with NSSI.

In accordance with previous studies reporting that adolescents with NSSI carry a heavy burden of problems whether or not they had intent to die (Groholt et al., 2000), low family support and alcohol use were common among adolescents of this

study. As the integrated motivational-volitional model suggests suicidal behaviour should be seen as a cry of pain, and entrapment results when adolescent's attempt to escape from high stress or defeating circumstances blocked (O'Connor et al. 2003).

#### **8.4. Predictors of non-suicidal self-injury, suicidal ideation and suicide attempts during one-year follow-up**

Suicidal behaviour declined markedly during the follow-up, yet a third of adolescents were suicidal during follow-up. This finding is consistent with several studies of depressed adolescents showing that suicidality declines during treatment (Asarnow et al., 2011; TADS team, 2007; Vitiello et al., 2011). One-quarter of all depressed adolescents had NSSI during follow-up, which falls in the middle between 35% during a 28-week follow-up in the ADAPT study (Wilkinson et al., 2011) and 11% during a 24-week follow-up in the TORDIA study (Asarnow et al., 2011).

As in previous studies, depression during follow-up (Brent et al., 2009; Foley et al., 2006) and baseline suicidality (Apter and King, 2006; Asarnow et al., 2011; Fergusson et al., 2005; Ivarsson et al., 1998) predicted NSSI, SI and SA. Suicidality continued during follow-up in approximately half of subjects with baseline suicidality. Female gender and comorbidity predicted continuing suicidality. In previous studies the number of diagnoses has predicted repeated suicide attempts and adolescents with several comorbid diagnoses have been particularly vulnerable to future suicide acts (Groholt et al., 2006; Foley et al., 2006). Adolescents with comorbidity have higher levels of distress and impairment which may lead to suicidal behaviour if it continues (Nock et al., 2013).

As in previous studies, suicidal depressed adolescents and adolescents with NSSI used more alcohol than non-suicidal depressed adolescents (Asarnow et al., 2011; Skarbo et al., 2006; Wichtröm, 2000; Windle and Windle, 1997). Previous general population studies of adolescents have reported binge drinking (Archie et al., 2012) and substance use disorder (Foley et al., 2006) to associate with NSSI or SA.

Psychiatric comorbidity, alcohol use and suicidality at baseline predicted NSSI during one-year follow-up. These findings accord with those of the TORDIA study where NSSI at baseline and physical or sexual abuse predicted NSSI during follow-up (Asarnow et al., 2011), and the ADAPT study reporting hopelessness, comorbid anxiety disorder and NSSI at baseline to predict NSSI during follow-up (Wilkinson et al., 2011). As in this study, NSSI and SA also tended to co-occur in the TORDIA

study (Asarnow et al., 2011). NSSI and suicidal intent among adolescents probably overlap during periods of increased distress and vulnerability. In an international community sample of adolescents who self-harmed, wanting to die or get relief from a terrible state of mind were the two most likely reasons to be given; however, some adolescents gave both reasons simultaneously (Madge et al., 2008).

NSSI was predicted by a variety of psychosocial factors which were very similar with predictors of other suicidal behaviours. This finding seems consistent with previous studies suggesting that the risk factors for NSSI are comparable with risk factors for SA and with completed suicides (Hawton and James, 2005; Larsson and Sund, 2008). Suicidal adolescents whether they had suicidal intent or not, were equally burdened with their psychosocial situation, as also in previous studies (Asarnow et al., 2011; Groholt et al., 2000; Muehlenkamp and Gutierrez, 2007). It thus seems that adolescents with NSSI have as severe psychosocial problems as those engaging in other suicidal behaviour, and that the distinction between suicidal behaviour with suicidal intent and NSSI may be more subtle than often thought.

### **8.5. NSSI and SA as predictors of future suicidal behaviour among young adults**

In this cohort of depressed adolescent outpatients, the prevalence of both NSSI and SA declined when adolescents grew up to young adulthood. The prevalence of NSSI declined from 32% at baseline to 22% during the one-year and to 16% between the one-year and eight-year follow-ups, and the prevalence of SA dropped from 21% at baseline to 14% during the one-year and to 12% between the one-year and eight-year follow-ups. Most previous research on self-injurious behaviour has failed to distinguish the prognostic implications of SA with clear intent to die from NSSI.

Baseline SA was a significant risk factor for SA, while NSSI at baseline predicted NSSI in one-year follow-up. NSSI seemed to be the only risk factor for later NSSI and also a strong risk factor for later SA. When including both SA and NSSI in the model for the period between one-year and eight-year follow-ups, only NSSI predicted future SA showing NSSI as a strong predictor of SA. In the long-term analyses of NSSI, only NSSI predicted future NSSI, whereas SA had no predictive value for NSSI. This study, thus replicated the results of ADAPT (Wilkinson et al., 2011) and TORDIA (Asarnow et al., 2011) studies, but over a considerably longer follow-up period. Longer history of NSSI was also associated with increased rates of

SA among adolescents in the study by Nock et al. (2006). In addition, in a sample of adult inpatients, those with a history of NSSI were more likely to report a history of SA than those with no previous NSSI (Andover and Gibb, 2010).

There were two suicides during the eight-year follow-up, both were preceded by NSSI, and one suicide completer also had a history of SA at baseline. Major depressive disorder has been the most common single disorder, present in 35% of adolescent suicides (Bridge et al., 2006). Self-harm (with or without suicidal intent) is an important predictor of future completed suicide and there seems to be no difference in suicide risk over time between those with suicidal and non-suicidal self-harm episodes (Cavanagh et al., 2003; Cooper et al., 2005). Also in a follow-up study of adolescents who had engaged in self-harm (Hawton et al., 2012), NSSI carried a high risk of eventual suicide. Further, one large all-ages cohort study demonstrated that an act of either type of self-harm is associated with a greatly increased risk of suicide over a four-year follow-up (Cooper et al., 2005).

The result of NSSI predicting future NSSI in both the shorter and longer follow-up and also predicting future SA in the longer follow-up may clarify more of the spectrum of non-suicidal self-harm. The most common reason for NSSI is to relieve intense distressing affect by the use of sharp physical pain, which can distract the sufferer from his or her unbearable feelings (Cooper et al., 2005). This is in line with the result in this study, that depressed adolescents with NSSI had more depressive symptoms than non-suicidal depressed adolescents. Adolescents with NSSI may have emotion regulation deficits (Muehlenkamp and Gutierrez, 2007), NSSI may fail to produce sufficient relief from intrapersonal and/or interpersonal distress, and vulnerable adolescents may therefore turn to SA (Asarnow et al., 2011). Taken together, the extant findings about NSSI support the view that both NSSI and SA share an underlying problem with negative affect and its regulation. These commonalities may explain both their co-occurrence and the most frequently cited motivations for each behaviour. Adolescents with NSSI often engage in the behaviour in order to manage their negative affect (Nock and Prinstein, 2004) whereas suicide attempters may seek a permanent end to the experience of distressing emotions (Cox et al., 2012).

Another possibility is that engaging in NSSI desensitizes adolescents to self-harm behaviours, thus lowering the barriers to future NSSI and further to SA (Joiner, 2005). This hypothesis is supported by results in this study showing that younger age is associated with NSSI. It is possible that NSSI is a predictor of SA because NSSI is an earlier manifestation of vulnerability than SA to mood dysregulation that serves

as a potential common diathesis for both NSSI and SA (Brent et al., 2009; Cox et al., 2012). According to Joiner's interpersonal-psychological theory of suicidal behaviour (Joiner, 2005), adolescents make serious suicide attempts only if they have the combination of an intention to die and the capability to act on that intention. Repeated NSSI may result in higher pain tolerance and reduced fear of death.

### **8.6. Alcohol use as risk factor and perceived social support as risk and protective factor for future SA and NSSI among young adults**

Treating depression effectively is likely to reduce rates of suicidality, however, data on factors increasing the risk of NSSI and SA are needed. NSSI and SA were associated partly with a different pattern of predictors. Alcohol use and low perceived social support from friends predicted SA both during the shorter and longer follow-ups. Younger age, NSSI and alcohol use at baseline predicted NSSI in the shorter follow-up, while NSSI was the only significant predictor of NSSI in the longer follow-up.

Alcohol use is prospectively associated with SA and NSSI in adolescents (Cooper et al., 2005; Skarbo et al., 2005) and high alcohol use was independently associated with self-harm, with and without suicidal intent, among adolescents and young adults in a population-based cohort study (Moran et al., 2012). The finding that alcohol use predicted SA in the long-term concurs with the findings of a 5-9-year follow-up of child and adolescent outpatients (Skarbo et al., 2005) where alcohol misuse was a risk factor for SA. Furthermore, adolescents with SA who had received emergency treatment had more alcohol problems and more mental disorders than non-attempters during a follow-up (Skarbo et al., 2005).

With age, attachment to and perceived support from family decreases, while reliance on peers for support increases. Thus, the result of this study that support from peers was a protective factor for future SA, while support from the family was not, may show that declines in the strength of adolescents' connections with family reflect normative decreases in dependence on parents, and not necessarily dysfunctional family processes. The influence of friendships increases dramatically during adolescence (Kerr et al., 2006; Prinstein et al., 2001; Prinstein et al., 2008). Higher peer support was associated with increased age in this study, mirroring normative trends toward increased affiliation and reliance on peers across adolescence, and decreased parental influence on identity development (Prinstein et al., 2001).

To understand the role of friendships in SA and NSSI it is therefore important to study the quality of friendships. Several studies have shown that having unsupportive friends may be worse for adolescent well-being than having no friends at all (Prinstein et al., 2000). In a study of hospitalized suicidal adolescents, lack of support from friends, low perceived peer acceptance, high perceived peer rejection and affiliation with deviant peers associated with suicidal ideation, either directly or indirectly (Prinstein et al., 2000). A study of adolescents hospitalized after SA also showed that infrequent peer support placed an adolescent at a higher risk for SA (Groholt et al., 2000). Furthermore, in a national sample of adolescents, the relationship of friendship factors and suicidality was stronger than that between depression and suicidality in females, suggesting that friendship problems may be particularly important in females' suicidality (Bearman and Moody, 2004). Early depression may play a role in diminishing future available sources of social support, perhaps through alienation from friends during adolescence, or unwillingness to participate in social events, which persist into adulthood (Naicker et al., 2013). According to the integrated motivational-volitional model of suicidal behaviour (O'Connor, 2011), when an adolescent feels both defeated and trapped, the likelihood that suicidal behaviour will emerge increases when motivational moderators, for example low levels of social support are present (O'Connor and Nock, 2014).

## 8.7. Methods

### 8.7.1. Strengths of the study

The study sample was large and based on consecutive referrals. The assessments were thorough and based on well-studied interview instruments and self-report scales. This study focused on depressive disorders and adolescents themselves are known to report reliably the symptoms of these disorders (Sanford et al., 1995), parents were not interviewed. Compared with many previous clinical studies on adolescent depression and suicidal behaviour, a wide spectrum of depressive disorders and suicidal behaviours were assessed, including non-suicidal self-injury in addition to suicidal ideation and suicide attempts. Non-suicidal self-injury was clearly distinguished from suicidal ideation and suicide attempts enabling study of its impact on other forms of suicidality during the follow-up. This is the first study with such a long follow-up time to study the predictive impact of NSSI in depressed adolescents.

### 8.7.2. Limitations of the study

Although the sample at baseline was large, the low number of males and younger adolescents may have affected the ability to detect gender and age differences. The relatively large number of positively screened subjects who dropped out is a weakness. As drop-outs or those refusing to participate scored lower on the screening instruments, the subjects of this study represent those with more severe depression than those lost to attrition. This may have affected the relatively high NSSI rates.

During the eight-year follow-up the number of participating males was even lower. Likewise the small sample size in different groups of psychiatric comorbidity limited the power to detect differences between groups, and the obtained results should be interpreted with this in mind. The lifetime age of onset data were obtained retrospectively, which can be considered as a limitation.

SA and NSSI include behaviours that vary considerably in seriousness. Unfortunately, information about the severity and lethality of NSSI was not collected. Furthermore, a more detailed assessment of NSSI including the data on repetitive NSSI would have provided additional information. In addition, it cannot be assumed that these results necessarily apply to non-referred adolescents with NSSI, who probably form the majority of youth with NSSI.

In the longer follow-up, data on non-suicidal self-injurious behaviour were collected only at the time of the eight-year follow-up assessment, which may have led to under-reporting of non-suicidal self-injurious events in the period between the one-year and eight-year follow-ups. Self-report scales were used to assess alcohol use and social support. Thus the results may be an underestimation of alcohol problems. Yet, adolescents seem to report their use of alcohol relatively reliably (Lintonen et al., 2004). Use of self-report assessment for perceived social support also limited more specific analyses of the quality of peer relationships and family-related factors.

The results from this clinical sample may not be directly generalized to populations other than adolescent outpatients. Generalization to other cultures should also be made with the understanding of possible differences between health care systems.

## 9. CONCLUSIONS

### 9.1. Clinical implications

Suicide risk in adolescents is still undetected. It is noteworthy that suicidal adolescents typically enter treatment before rather than after suicidal behaviours. All expressions of suicide intent have to be taken seriously and indicate assessment of the adolescent's development and life circumstances. While depressive disorders are among the most important psychiatric disorders associated with adolescent suicide and suicidal behaviour, and research-based knowledge on adolescent depression increases, they are still under-recognized and under-treated. Since most adolescents committing suicide have suffered from psychiatric disorders, particularly from depression, early recognition and effective treatment of these disorders are key issues in the prevention of youth suicidal behaviour.

In addition to depressed disorders in adolescents, psychiatric comorbidity with depression is strongly associated with suicidal ideation, suicide attempts and NSSI. Careful screening for psychiatric comorbidity and substance use problems is important for identifying adolescents at high risk for suicidal behaviour. The association of depressive and anxiety symptoms with SA and NSSI in depressed adolescents emphasizes the need to also assess symptoms dimensionally as part of the evaluation of adolescents. Assessing the severity of impairment will help to identify depressed adolescents who are most at risk for suicidality.

Younger adolescents with less severe depression and NSSI may be demonstrating severe suicidality. This finding is important to clinicians because early identification of depressed adolescents who injure themselves could help to prevent escalation of further suicidal behaviour and suicide.

By its name clinical staff may see NSSI as not important as it is “only non-suicidal”, they may therefore not think it so important to treat these adolescents. Notably, NSSI may not lead to changes in treatment plans, and an adolescent patient may turn to SA. The increasing knowledge of NSSI and its strong association with suicidal behaviour, hopefully leads patients presenting with it to be better assessed and treated. If the behaviour is viewed as an attempt to end one’s life, health professionals are more sympathetic than when they believe the adolescent is engaging in self-harm for some other purpose. If an adolescent contacts health care personnel due to psychiatric problems, it is also important to ask her or him about possible self-harm, suicidal thoughts and behaviour and raise these issues so that they can be shared in discussion.

Assessment of social support that suicidal depressed adolescents receive from family members and from friends also needs to be evaluated, as it represents one potential resource in suicide prevention and treatment.

## 9.2. Implications for future research

Research on risk and protective factors for youth, NSSI, SI and SA provides the basis for suicide prevention. Growing evidence indicates that mood disorders, especially when comorbid, substance abuse and previous SA are key risk factors for suicidal behaviour. It is also well known that family adversity is a strong risk factor for psychopathology and suicidal behaviour, and that suicidality associates with other health risk behaviours. However, much less is known what the mechanisms are by which the risk factors operate. Research during the past years has shown that NSSI has a strong association with not only future NSSI but also with SA. Further studies with long enough follow-ups are needed to confirm and better understand this association.

Much less is known about factors that protect adolescents from suicidal behaviour. For example, research on the role of family support, support from peers and the interaction between protective and risk factors are needed in order to develop effective interventions for prevention and treatment of youth suicidal behaviour.

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## ORIGINAL PUBLICATIONS I–IV

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# Suicidal ideation, deliberate self-harm behaviour and suicide attempts among adolescent outpatients with depressive mood disorders and comorbid axis I disorders

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■ **Abstract** *Objective* We aimed to analyse and compare prevalence and associated clinical features of suicidal ideation, self-harm behaviour with no suicidal intent and suicide attempts among adolescent outpatients with depressive mood disorders with or without comorbidity. *Method* A sample of 218 consecutive adolescent outpatients aged 13–19 years with depressive mood disorders was interviewed using K-SADS-PL for DSM-IV Axis I diagnoses. They filled out self-report questionnaires assessing depressive and anxiety symptoms. Suicidal behaviour was assessed by K-SADS-PL suicidality items. *Results* Half of the subjects re-

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ported suicidal ideation or behaviour. There was no difference in prevalence of suicidal behaviour between non-comorbid and comorbid mood disorder groups. Multivariate logistic regression analyses produced the following associations: (1) suicidal ideation with self-reported depressive symptoms and poor psychosocial functioning, (2) deliberate self-harm behaviour with younger age and poor psychosocial functioning, and (3) suicide attempts with self-reported depressive symptoms and poor psychosocial functioning. *Conclusions* Depressed mood disorders, whether comorbid or not, are associated with suicidal ideation and suicide attempts. Diagnostic assessment should be supplemented by self-report methods when assessing suicidal behaviour in depressed adolescents.

■ **Key words** suicidality – adolescence – mood disorder – comorbidity

## Introduction

Depressive disorders are among the most prevalent psychiatric problems seen in adolescent psychiatric services, with approximately 30–50% of outpatients suffering from a depressive mood disorder [32, 39]. Studies on adolescent depression both in community

and clinical samples report high prevalence (40–70%) of comorbid disorders [3, 5, 14, 28, 32, 33]. Anxiety disorders are the most common comorbid disorders in youthful depression, affecting up to three-fourths of depressed youngsters [23, 28, 31, 35]. In general, comorbidity in adolescent depression is associated with psychosocial impairment [33], with a higher risk

for recurrence of depressive episodes, and increased use of mental health services [1, 32, 41].

While depressive disorders are among the most powerful predictors of suicidal ideation and suicide attempts in adolescents [4, 32, 34], the risk of suicidal ideation and suicide attempts further increases when depression is comorbid with disruptive behaviour, substance use and anxiety [6, 13, 25, 32, 50]. Recent studies suggest that self-harm behaviour, defined as a direct, socially unaccepted, repetitive behaviour that causes minor to moderate physical injury [29, 48], is also a risk factor for suicide attempts [21, 22, 51]. The association between self-harm behaviour and depressive disorders has been little studied [37].

Although anxiety disorders are the most common comorbid disorder in adolescent depression, research on their significance for suicidal behaviour seems inconsistent. Some studies have reported anxiety disorders as risk factors for suicidal ideation and suicide attempts [17, 20, 47]. Comorbid anxiety disorders in adolescent depressive disorders have been associated with increased suicidal ideation and suicide attempts in community samples [13, 17, 50]. On the other hand, clinical studies have reported anxiety disorders not to be risk factors for suicide attempts whether comorbid or not [4, 6, 47]. Besides diagnosed anxiety disorders previous research suggests that also symptoms of anxiety are associated with suicidal behaviour [12, 17]. One explanation of the inconsistent findings may be the variability in methods in measuring suicidal behaviour e.g. self-report questionnaires in some studies [13, 17, 49] and standardised structured interviews in others [32, 50]. Previous studies have not assessed simultaneously the whole spectrum of suicidal behaviours including suicidal ideation, deliberate self-harm behaviour and suicide attempts.

The aim of the present study was to analyse the prevalence, gender- and age differences, and associated clinical characteristics of suicidal ideation, self-harm behaviour with no suicidal intent and suicide attempts among adolescent outpatients suffering depressive disorders with no comorbidity compared to those with comorbid disorders. Suicidal behaviour was expected to be more common and severe among adolescents with depressive disorders with comorbidity.

## Methods

### Subjects and procedure

This study forms part of the Adolescent Depression Study (ADS), a collaborative study between the Department of Adolescent Psychiatry of the Peijas Medical Health Care District (PMCD) of Helsinki University Central Hospital and the Department of Mental Health and Alcohol Research in the National

Public Health Institute, Helsinki, Finland. The study population was drawn from the two adolescent psychiatric outpatient clinics of the PMCD between February 1st 1998 and December 31st 2001. Of the eligible 660 outpatients, 624 (94.5%) were screened during their first consultation visit with the Beck Depression Inventory (BDI-21) [8] and the General Health Questionnaire-36 (GHQ-36) [18]. The 373 patients with scores of 10 or more in the BDI-21 and 5 or more in the GHQ-36 were considered screen-positive and asked to participate in the study. At this point 118 (31.6%) outpatients refused and 34 (9.1%) dropped out. Refusal/dropping out was unrelated to sex ( $\chi^2 = 2.08$ ,  $df = 1$ ,  $P = 0.15$ ), age group ( $\chi^2 = 2.37$ ,  $df = 1$ ,  $P = 0.12$ ) and parental SES (1 = working class, 2 = lower middle class, 3 = upper middle class, 4 = other) ( $\chi^2 = 5.59$ ,  $df = 3$ ,  $P = 0.13$ ), while it associated with lower BDI-21 (19.0 vs. 21.0,  $z = -1.93$ ,  $df = 371$ ,  $P = 0.05$ ) and lower GHQ-36 (21.0 vs. 24.0,  $z = -1.98$ ,  $df = 367$ ,  $P = 0.05$ ) median sum scores. The 221 remaining outpatients were evaluated by diagnostic interview (Schedule for Affective Disorders and Schizophrenia for School-Aged Children - Present and Life-time, K-SADS-PL) [27] and the 218 diagnosed with a current depressive mood disorder were included in the study. The subjects' mean age was 16.4 (SD 1.6, range 13-19 years), 18% ( $n = 40$ ) were males and 82% ( $n = 178$ ) females.

In all, 72% ( $n = 157$ ) had one or more Axis I disorder in addition to a mood disorder. Comorbidity with anxiety disorders ( $n = 125$ , 57%) was most common, with 20% ( $n = 43$ ) of the subjects having an anxiety disorder plus at least one other comorbid disorder. Fifteen percent ( $n = 32$ ) had other comorbidity (substance use disorder ( $n = 18$ , 56.2%), eating disorder ( $n = 6$ , 18.8%), disruptive disorder ( $n = 12$ , 37.5%) excluding anxiety disorders. Comorbidity was unrelated to parental SES (1 = working class, 2 = lower middle class, 3 = upper middle class, 4 = other) ( $\chi^2 = 7.823$ ,  $df = 9$ ,  $P = 0.552$ ).

### Diagnostic interview

Nine researchers, also experienced clinicians, conducted the diagnostic interviews. K-SADS-PL, a semi-structured interview with high reliability and validity [27, 45], was used to assess DSM-IV Axis I disorders. All the research diagnoses were confirmed in a subsequent diagnostic meeting. Inter-rater reliability, assessed using 15 randomly selected videotaped interviews, was good for mood disorder diagnoses (weighted kappa [16, 44] for MDD, other mood disorder, no mood disorder 0.87(95% CI 0.81,0.93)). Patients were classified as suffering a comorbid psychiatric disorder if they had one or more non-affec-

tive Axis I diagnosis in addition to the depressive mood disorder.

Psychosocial functioning (Global Assessment of Functioning, GAF) was assessed according to the DSM-IV Axis V definitions [2]. A GAF rating score from 1 (most impaired) to 100 (least impaired) was assigned, with descriptors provided for each 10-point interval. To determine the rating, the researcher selected the 10-point interval that best described the patient's functioning and then used his or her judgement to assign an exact rating within that interval. In data analyses, the GAF score was treated as a continuous variable.

The time of onset of a disorder was identified as the time point when the minimum requirements for each DSM-IV diagnosis were simultaneously present. Probing questions were used to obtain the best possible accuracy. The duration of the current depressive disorder indicates the number of months the current depressive episode had persisted prior to the screening date. In data analyses, the time of onset and duration of the current depressive disorder were treated as continuous variables.

The subjects were classified into four groups according to psychiatric comorbidity: 1. subjects with depressive disorder without comorbidity, 2. subjects with a depressive disorder and an anxiety disorder, 3. subjects with a depressive disorder, an anxiety disorder and other comorbid disorders, and 4. subjects with a depressive disorder and other comorbid disorders excluding anxiety disorders.

## ■ Suicidal behaviour

Suicidal behaviour was determined using four questions from the screening section of the K-SADS-PL diagnostic interview relating suicidal thoughts ("1" = none, "2" = occasional, "3" = frequent), suicide attempts and their seriousness ("1" = none, "2" = ambivalent, "3" = serious), suicide attempts and their lethality ("1" = none, "2" = not life-threatening, "3" = life-threatening), and deliberate self-harm behaviour without intent to die ("1" = none, "2" = occasional, "3" = frequent). Based on these questions, four mutually exclusive subgroups of suicidal behavior present during the most severe phase of the current mood disorder episode were constructed: (1) subjects coded "1" or "2" in all items were coded "non-suicidal", (2) "suicidal ideation" consisted of subjects who had suicidal thoughts frequently ("3") but had not attempted suicide, (3) the "deliberate self-harm behaviour" group included subjects who had frequent deliberate self-harm ("3") and (4) the "suicide attempts" group consisted of adolescents who had made one or more serious or life-threatening suicide at-

tempts ("3"). Suicidal behaviour was coded according to the most serious behaviour reported. Thus e.g. a subject with both deliberate self-harm behaviour and suicide attempt was classified in the "suicide attempt" group. Suicidal behaviour was unrelated to parental SES ( $\chi^2 = 7.562$ ,  $df = 9$ ,  $P = 0.579$ ).

## ■ Measurement of depressive and anxiety symptoms

Depressive symptoms were assessed using the Beck Depression Inventory-21 (BDI-21) [8]. The BDI-21 is a standardised 21-item questionnaire, a well-studied screen for youthful depression [10, 38]. The adolescent was asked to rate how much he or she had been bothered by each symptom on a 4-point scale ranging from 0 (not at all) to 3 (severely).

Anxiety symptoms were assessed using the Beck Anxiety Inventory (BAI) [7]. The Beck Anxiety Inventory is a 21-item self-report measure of anxiety symptoms, validated both in adults and adolescents [7]. The adolescent was asked to rate how much he or she had been bothered by each symptom over the past week on a 4-point scale ranging from 0 (not at all) to 3 (severely).

The Beck Depression Inventory-21 and the Beck Anxiety Inventory were introduced to the adolescents during the first consultation visit.

## ■ Data analyses

SPSS 11.0 software was used in data analyses [46]. The group comparisons were analysed using the Chi Square and Fisher's Exact test. Non-parametric descriptive statistics were applied for non-normally distributed numerical variables (Kruskall-Wallis, Mann-Whitney *U*). Equality of the means was tested using the one-way analysis of variance (ANOVA). Post hoc subgroup differences were compared using the Bonferroni procedure, with 0.05 as the level of significance in multiple comparisons. To analyse factors associated with different kinds of suicidal behaviour (dependent variable) and to get the most important predictors, a multivariate logistic regression analysis using a backward selection procedure was performed. *P*-values < 0.05 and odds ratios (OR) with lower 95% confidence intervals (95% CI) > 1 were considered statistically significant.

## Results

### ■ Prevalence of suicidal behaviour by gender and age

Half of the adolescents reported suicidal ideation or behaviour, 19% had only suicidal ideation, 13% had

**Table 1** Characteristics of adolescent outpatients with mood disorder according to suicidal behaviour

	No suicidality	Suicidal ideation	Deliberate self-harm behaviour	Suicide attempts	Total
<i>Females (n%)<sup>a</sup></i>					
13–15 years	25 (45.5)	6 (10.9)	13 (23.6)	11 (20.0)	55 (100.0)
16–19 years	65 (52.8)	26 (21.1)	11 (8.9)	21 (17.1)	123 (100.0)
Total	90 (50.6)	32 (18.0)	24 (13.5)	32 (18.0)	178 (100.0)
<i>Males (n%)<sup>a</sup></i>					
13–15 years	6 (60)	1 (10.0)	2 (20.0)	1 (10.0)	10 (100.0)
16–19 years	16 (53.3)	9 (30.0)	3 (10.0)	2 (6.7)	30 (100.0)
Total	22 (55.0)	10 (25.0)	5 (12.5)	3 (7.5)	40 (100.0)
<i>All subjects (n%)</i>					
13–15 years <sup>b</sup>	31 (47.7)	7 (10.8)	15 (23.1)	12 (18.5)	65 (100.0)
16–19 years <sup>b</sup>	81 (52.9)	35 (22.9)	14 (9.2)	23 (15.0)	153 (100.0)
Total	112 (51.4)	42 (19.3)	29 (13.3)	35 (16.1)	218 (100.0)
BDI-21 score, <sup>c</sup> Mean, (SD)	19.5 (7.6)	25.8 (8.8)	22.2 (9.5)	27.5 (10.5)	22.4 (9.2)
BAI score, <sup>d</sup> Mean, (SD)	20.1 (12.2)	25.9 (13.0)	21.2 (11.2)	26.7 (12.5)	22.4 (12.5)
GAF score, <sup>e</sup> Mean, (SD)	55.3 (9.7)	49.0 (9.1)	49.9 (9.5)	45.3 (11.8)	51.8 (10.6)

<sup>a</sup>Difference between females and males,  $\chi^2 = 3.218$ ,  $df = 3$ ,  $P = 0.359$

<sup>b</sup>Difference between younger and older adolescents,  $\chi^2 = 10.700$ ,  $df = 3$ ,  $P = 0.013$

<sup>c</sup> $F = 10.454$ ,  $df = 3$ ,  $P = 0.000$

<sup>d</sup> $F = 3.594$ ,  $df = 3$ ,  $P = 0.015$

<sup>e</sup> $F = 11.028$ ,  $df = 3$ ,  $P = 0.000$

deliberate self-harm behaviour and 16% had attempted suicide. There were no gender differences in the types of suicidality ( $\chi^2 = 3.218$ ,  $df = 3$ ,  $P = 0.359$ ) (Table 1).

Suicidal ideation was more common among subjects aged 16–19 years (23%) compared to those aged 13–15 years (11%), while deliberate self-harm behaviour was more common among younger than older subjects (23% vs. 9%, respectively), ( $\chi^2 = 10.700$ ,  $df = 3$ ,  $P = 0.013$ ) (Table 1).

### ■ Clinical characteristics of adolescents with suicidal behaviour

The severity of depressive symptoms as measured by the BDI-21 differed significantly between the four suicidal behaviour groups ( $F = 10.454$ ,  $df = 3$ ,  $P = 0.000$ ) (Table 1). In subgroup comparisons adolescents with suicidal ideation or attempted suicide had significantly higher levels of depressive symptoms than those with no suicidal behaviour ( $P = 0.001$ ,  $P = 0.000$ , respectively).

The severity of anxiety symptoms as measured by the BAI also differed significantly between the four suicidal behaviour groups ( $F = 3.594$ ,  $df = 3$ ,  $P = 0.015$ ) (Table 1). Subgroup analyses showed that the difference was due to higher anxiety symptom scores among adolescents who had attempted suicide compared with non-suicidal adolescents ( $P = 0.049$ ).

Psychosocial functioning differed significantly between the suicidal behaviour groups ( $F = 11.028$ ,

$df = 3$ ,  $P = 0.000$ ) (Table 1). In subgroup comparisons adolescents who had suicidal ideation or who had attempted suicide had lower psychosocial functioning than non-suicidal adolescents ( $P = 0.004$ ,  $P = 0.000$ , respectively).

The frequencies of the subgroups of suicidal behaviour did not differ significantly between the four depressive disorder groups ( $\chi^2 = 7.708$ ,  $df = 9$ ,  $P = 0.564$ ) (Table 2). There were no differences in the frequencies of the three types of suicidal behaviours between non-comorbid and comorbid depressive disorder groups, either by gender (males:  $\chi^2 = 3.635$ ,  $df = 3$ ,  $P = 0.304$ , females:  $\chi^2 = 5.197$ ,  $df = 3$ ,  $P = 0.158$ ) or age (13–15 years:  $\chi^2 = 0.238$ ,  $df = 3$ ,  $P = 0.971$ , 16–19 years:  $\chi^2 = 0.328$ ,  $df = 3$ ,  $P = 0.507$ ).

Mean age of onset of the first mood disorder episode was 13.1 years (SD 3.16) among non-suicidal adolescents, 13.6 years (SD 2.87) among those with suicidal ideation, 13.3 years (SD 1.99) among those with deliberate self-harm and 13.4 (SD 2.43) among adolescents who had attempted suicide. Age of onset was not significantly associated with the four suicidal behaviour groups ( $F = 0.236$ ,  $df = 3$ ,  $P = 0.871$ ). Mean duration of current depressive disorder was 16 months (median 6.3) among non-suicidal adolescents, 24 months (median 6.3) among those with suicidal ideation, 12 months (median 6.5) among those with deliberate self-harm, and 22 months (median 10.7) among adolescents with a suicide attempt. Duration of the current mood disorder episode was not associated with the four suicidal behaviour groups ( $\chi^2 = 4.705$ ,  $df = 3$ ,  $P = 0.195$ ).

**Table 2** Suicidal behaviour in adolescent outpatients with depressive mood disorders with or without comorbidity

	No suicidality (n,%)	Suicidal ideation (n,%)	Deliberate self-harm behaviour (n,%)	Suicide attempts (n,%)
<i>Mood disorder category</i>				
Non-comorbid disorders				
Females <sup>a</sup>	21 (23.3)	7 (21.9)	10 (41.7)	12 (37.5)
Males <sup>a</sup>	8 (36.4)	2 (20.0)	0	1 (33.3)
13–15 years <sup>b</sup>	10 (32.3)	2 (28.6)	5 (33.3)	4 (33.3)
16–19 years <sup>b</sup>	19 (23.5)	7 (20.0)	5 (35.7)	9 (39.1)
Total	29 (25.9)	9 (21.4)	10 (34.5)	13 (37.1)
Comorbid with anxiety disorders				
Females <sup>c</sup>	39 (43.3)	17 (53.1)	6 (25.0)	7 (21.9)
Males <sup>c</sup>	5 (22.7)	3 (30.0)	3 (60.0)	2 (66.7)
13–15 years <sup>d</sup>	10 (32.3)	4 (57.1)	4 (26.7)	3 (25.0)
16–19 years <sup>d</sup>	34 (42.0)	16 (45.7)	5 (35.7)	6 (26.1)
Total	44 (39.3)	20 (47.6)	9 (31.0)	9 (25.7)
Comorbid with anxiety and other disorders				
Females <sup>e</sup>	16 (17.8)	7 (21.9)	4 (16.7)	7 (21.9)
Males <sup>e</sup>	5 (22.7)	3 (30.0)	1 (20.0)	0
13–15 years <sup>f</sup>	5 (16.1)	1 (14.3)	1 (6.7)	3 (25.0)
16–19 years <sup>f</sup>	16 (19.8)	9 (25.7)	4 (28.6)	4 (17.4)
Total	21 (18.8)	10 (23.8)	5 (17.2)	7 (20.0)
Comorbid with other disorders				
Females <sup>g</sup>	14 (15.6)	1 (3.1)	4 (16.7)	6 (18.8)
Males <sup>g</sup>	4 (18.2)	2 (20.0)	1 (20.0)	0
13–15 years <sup>h</sup>	6 (19.4)	0	5 (33.3)	2 (16.7)
16–19 years <sup>h</sup>	12 (14.8)	3 (8.6)	0	4 (17.4)
Total	18 (16.1)	3 (7.1)	5 (17.2)	6 (17.1)

<sup>a</sup> $\chi^2 = 4.955$ ,  $df = 3$ ,  $P = 0.175$

<sup>b</sup> $\chi^2 = 1.717$ ,  $df = 3$ ,  $P = 0.633$

<sup>c</sup> $\chi^2 = 2.974$ ,  $df = 3$ ,  $P = 0.396$

<sup>d</sup> $\chi^2 = 2.450$ ,  $df = 3$ ,  $P = 0.484$

<sup>e</sup> $\chi^2 = 2.401$ ,  $df = 3$ ,  $P = 0.494$

<sup>f</sup> $\chi^2 = 2.466$ ,  $df = 3$ ,  $P = 0.481$

<sup>g</sup> $\chi^2 = 5.051$ ,  $df = 3$ ,  $P = 0.168$

<sup>h</sup> $\chi^2 = 9.580$ ,  $df = 3$ ,  $P = 0.022$

## Multivariate analyses

Multivariate logistic regression analyses were conducted using a backward selection procedure for each of the suicidal behaviour groups (suicidal ideation only, deliberate self-harm behaviour and suicide attempts) versus non-suicidal adolescents. All models were performed to simultaneously control the effects of comorbid Axis I disorders, age, gender, severity of depression and anxiety symptoms, psychosocial functioning, age of onset of the first mood disorder episode and duration of the current mood disorder episode.

The significant variables for having suicidal ideation compared with no suicidality were depressive symptoms and poor psychosocial functioning (Hosmer–Lemeshow Goodness-of-Fit  $\chi^2 = 3.446$ ,  $df = 8$ ,  $P = 0.903$ , model classified correctly 76.8% of the subjects) (Table 3). The significant predictors for having deliberate self-harm behaviour compared with no suicidality were younger age and poor psychosocial functioning. In addition, the model included variables (depressive symptoms) which although statistically non-significant improved the

predictive ability of the model (Hosmer–Lemeshow Goodness-of-Fit  $\chi^2 = 8.327$ ,  $df = 8$ ,  $P = 0.411$ , model classified correctly 81.5%) (Table 3). The significant predictors for having made a suicide attempt compared with no suicidality were depressive symptoms, poor psychosocial functioning and not having depressive disorder comorbid with anxiety disorder. Variables which were statistically non-significant but improved the predictive ability of the model were: depressive disorder with anxiety and other comorbidity, depressive disorder with other comorbidity, older age of onset for the first mood disorder, and older age (Hosmer–Lemeshow Goodness-of-Fit  $\chi^2 = 17.00$ ,  $df = 8$ ,  $P = 0.024$ , model classified correctly 87.2%) (Table 3).

## Discussion

This large naturalistic study investigated whether suicidal ideation, deliberate self-harm behaviour and suicide attempts differed between depressed adolescent outpatients with and without comorbidity. Somewhat surprisingly, based on diagnostic classifi-

**Table 3** Odds ratios of predictor variables for suicidality among adolescent outpatients with mood disorders

Characteristic	Predictor	OR	95% CI	P
No suicidality versus suicidal ideation	BDI-21	1.10	1.04–1.16	0.000
	GAF	0.94	0.90–0.99	0.010
No suicidality versus deliberate self-harm behaviour	Age	0.25	0.10–0.65	0.004
	GAF	0.93	0.88–0.98	0.009
	BDI-21	1.05	0.99–1.11	0.077
No suicidality versus suicide attempt	BDI-21	1.13	1.06–1.21	0.000
	GAF	0.89	0.83–0.95	0.000
	Onset of first mood disorder	1.19	0.98–1.44	0.075
	Age	0.38	0.12–1.23	0.106
	Mood disorder, anxiety	0.23	0.06–0.90	0.035
	Mood disorder, anxiety, other comorbidity	0.22	0.04–1.17	0.076
	Mood disorder, other comorbidity	1.21	0.30–5.00	0.791

Abbreviations: BDI-21 = Beck Depression Inventory, BAI = Beck Anxiety Inventory, GAF = Psychosocial functioning, OR = odds ratio

cation only, no statistically significant differences were found in different forms of suicidal behaviour between non-comorbid and comorbid depressive disorders. However, when self-reported depressive and anxiety symptoms and psychosocial functioning were taken into account in multivariate analyses, there was a trend that suicide attempts associated with comorbidity, which lends some support to the initial hypothesis of more severe suicidal behaviour in depressive disorders with comorbidity.

The relatively high prevalence (49%) of any suicidality in depressed adolescent outpatients in our study falls within the previously reported range of 42–58% [32, 40]. Estimates of the prevalence of suicidal ideation in depressed adolescent outpatients have varied from 25 to 66% [32, 40]. The lower prevalence (19%) of suicidal ideation in this report was due to its classification among the most serious suicidal behaviour. The prevalence of suicide attempts has varied from 20% to 24% in adolescent outpatients with major depression [32, 40], in the present sample it was slightly lower (16%). The prevalence of deliberate self-harm behaviour for this sample (13%) was also lower than that estimated in general clinical samples (21%) [9], and among adolescent inpatients (40%) [11]. These lower prevalences are probably due to our methodological decision to include only unambiguous suicidal ideation and behaviour, and to the relatively high threshold of the K-SADS-PL interview for suicidality [24].

Several previous studies emphasising the significance of psychiatric comorbidity in youthful suicidal behaviour have been based on community samples [13, 20, 34, 50]. In these studies depression, particularly when comorbid with disruptive behaviour, substance use and anxiety disorders, has been associated with high rates of suicide attempts. Furthermore, the risk of suicidal behaviour appears to rise for combinations of these disorders. Adolescent suicide attempters have reportedly had higher rates of

psychiatric disorders than those with only suicidal ideation [6, 15]. However, in the clinical study by Wetzler et al. [49], depressed adolescent outpatients with suicidal ideation did not differ from those with suicide attempts according to psychiatric diagnoses, and in the clinical study by Goldston et al. [19], adolescent inpatients who had attempted suicide did not differ from non-suicidal inpatients in rates of comorbid mood and anxiety disorders. Probably the more severe degree of depression in the present sample and in other clinic-referred samples [49] has masked the impact of comorbid disorders on suicidal ideation and attempts. However, a general understanding to emerge from research so far is that depressive disorders, whether comorbid or not, are specifically associated with suicidal behaviour [12, 34, 47, 49].

Previous research gives a somewhat inconsistent picture of the impact of comorbid anxiety disorders on suicidal behaviour in youthful depressive mood disorders. Some studies based on community samples have found comorbid anxiety disorders to be risk factors for suicidal behaviour in depressive disorders [13, 50], while other studies, based on clinical samples have not [19, 49]. Our finding that symptoms of anxiety but not categorical diagnoses of anxiety disorders associated with suicide attempts in depressed adolescents is consistent with previous findings of significant associations of anxiety symptoms and suicidal behaviour in adolescent depression [12, 17, 30, 49]. This finding may indicate that the role of anxiety in youthful suicidality is not sufficiently detected if only a dichotomous measure of a diagnosis is used.

Depressed adolescents who had deliberately harmed themselves differed from those with suicidal ideation or suicide attempts. Depressed self-harmers were younger than subjects with other suicidal behaviours. The onset age of self-harm behaviour in other studies has commonly been approximately 13–

14 years [37], while suicidal ideation rates increase after 16 years [34], and the rates of suicide attempt after 14 years [34]. So our findings here accord with previous studies. Adolescents who had deliberate self-harm behaviour had less severe depressive symptoms than those with suicidal ideation or suicide attempt. In this case, previous research conducted with community samples is not comparable with our study. In community samples, adolescents who have self-harmed themselves report more depressive symptoms than those with no self-harm [36, 37, 42]. Moreover, unlike earlier reports that both depression and anxiety are linked with deliberate self-harm behaviour [26, 29], we found no such association. Again, these previous studies were based on community samples. The role of depression and anxiety in deliberate self-harm behaviour may be different in youthful community samples compared with clinical study samples when the subjects are severely depressed outpatients.

### ■ Methodological considerations

The study sample was large and based on consecutive referrals. The assessments were thorough and based on well-studied interview instruments and self-report scales. As this study focused on depressive disorders which adolescents themselves are known to report reliably [43], parents were not interviewed. Compared with many previous clinical studies on adolescent mood disorders and suicidal behaviour [19, 49], a wide spectrum of suicidal behaviours was assessed, including deliberate self-harm behaviour in addition to suicidal ideation and suicide attempts. In order to separate severe suicidal behaviour, only unambiguous suicidal behaviours fulfilling the “threshold” criteria in the K-SADS-PL were assessed.

The results from this clinical sample may not be directly generalised to populations other than adolescent outpatients. Although the sample was large, the low number of males and younger adolescents may have affected our ability to detect gender and age differences. Likewise the small sample size in different groups of psychiatric comorbidity limited the power to detect differences between groups, and the obtained results should be interpreted with this in mind. The life-time age of onset data were obtained retrospectively, which can be considered as a limitation.

### ■ Implications

It is primarily depressed disorders in adolescents, whether comorbid or not, which are associated with suicidal ideation and suicide attempts. The association of anxiety symptoms with suicide attempts in depressed adolescents emphasises the need for anxiety symptoms to be assessed as part of the evaluation of risk for suicidal behaviour in youth. Self-report instruments of anxiety may be useful supplements to the clinical interview. Younger adolescents with less severe depression who deliberately self-harm may be demonstrating suicidality. This finding is important to clinicians because early identification of depressed adolescents who deliberately self-harm could help to prevent escalation of suicidal behaviour. Further research on the correlates and consequences of self-harm behaviour among depressed adolescents is needed.

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## Factors associated with deliberate self-harm behaviour among depressed adolescent outpatients

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### Abstract

This study examined whether depressed adolescent outpatients with deliberate self-harm behaviour (DSH) differed from non-suicidal depressed adolescent outpatients in depressive and anxiety symptoms, alcohol use, perceived social support and number of negative life-events. Depressed adolescent outpatients ( $n = 155$ ) aged 13–19 years were interviewed using K-SADS-PL for DSM-IV Axis I diagnoses and completed self-report questionnaires. Suicidal behaviour was assessed by K-SADS-PL suicidality items. Depressed adolescents with DSH were younger, perceived less support from the family, had more severe depressive symptoms and used more alcohol than non-suicidal depressed adolescents. Adolescents with DSH and suicidal ideation or suicide attempts had more depressive and anxiety symptoms than adolescents with DSH only. Adolescents with severe internalizing distress symptoms are at risk not only for DSH, but also additional suicidal behaviour. Family interventions may be needed in the treatment of depressed adolescents with DSH.

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## Introduction

Deliberate self-harm (DSH) is defined as the intentionally injuring of one's own body without apparent intent to die (Brunner et al., 2007). Understanding deliberate self-harm (DSH) is, however, complicated by the multiple terminology used to describe the behaviour and the confusion as to whether or not DSH represents a suicide attempt (Muehlenkamp & Gutierrez, 2004). Actions with a low likelihood of death but covered by the term "self-harm" have been described as suicidal behaviours, deliberate self-harm, other self-harm behaviours, self-mutilation, self-wounding and self-injurious behaviour (Skegg, 2005). A suicide attempt, by definition, is an intentional action to end life (Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). The most serious forms of DSH relate closely to suicide, while behaviours at the milder end of the spectrum merge with other reactions to emotional pain (Skegg, 2005). Previous studies have shown that it is difficult to draw the line between suicide attempts and DSH acts of adolescents because of the serious forms of DSH and complexity and mix of intentions behind the latter (Skegg, 2005).

Between 5 and 9% of adolescents in Australia, USA and England report having self-harmed in the previous year, with few episodes seeming to be true suicide attempts (Skegg, 2005). The incidence of DSH among adolescent inpatients is much higher, ranging from 40% to 61% (Suymoto, 1998). DSH is linked with suicide, since 25–50% of those committing suicide have previously self-harmed (Hawton & James, 2005). Previous research has shown high prevalences of depressive disorders (Burgess, Hawton, & Loveday, 1998; Harrington et al., 2006) in adolescents presenting to hospitals or psychiatric services following DSH. Moreover, in a prospective cohort study rates of depression distinguished adolescents with DSH who self-harmed in adulthood from those who did not (Harrington et al., 2006). Besides depression, common disorders among hospitalized adolescents with DSH have been oppositional defiant disorder, conduct disorder, substance use disorders, post-traumatic stress disorder and generalized anxiety disorder (Burgess et al., 1998; Nock et al., 2006). Further, adolescents with DSH have had higher levels of depressive (Haavisto et al., 2005; Hawton, Rodham, Evans, & Weatherall, 2002; Ross & Heath, 2002) and anxiety symptoms (Haavisto et al., 2005; Ross & Heath, 2002) in community samples. Most studies of DSH have been conducted on adolescent community samples or adolescent inpatients, so information regarding depressed adolescent outpatients with DSH is scarce.

Despite the high prevalence of risks related to DSH among adolescents, little is known about the determinants of DSH. Previous studies show that family structure, parental divorce, severe illness of a parent, and living apart from parents are associated with DSH both in community studies (Haavisto et al., 2005; Mittendorfer-Rutz, Rasmussen, & Wasserman, 2004) and among adolescent inpatients (Beautrais, 2001; Haavisto et al., 2005; Skegg, 2005). Moreover, heavy alcohol use has been shown to increase the risk of DSH (Haavisto et al., 2005; Skegg, 2005).

Lack of family support is associated with greater severity of adolescents' depressive symptoms and suicidal ideation among inpatients (Kerr, Preuss, & King, 2006) and outpatients (Epstein, 1994; Perkins & Hartless, 2002). Suicidal adolescents in community studies have had fewer supportive adults and more commonly unsupportive parents than non-suicidal adolescents (Evans, Hawton, & Rodham, 2004; Martin, Rozanes, Pearce, & Allison, 1995). Evans et al. (2004) reported an association between problems in peer relations and suicide attempts, but not between the degree of perceived support from peers and suicide attempts in a community sample of adolescents (Evans et al., 2004). Little is known about perceived social support among depressed adolescents with DSH.

There is little detailed information on depressed adolescents with DSH and negative life-events. Adolescent suicide attempts have been associated with negative life-events and failure to adapt to them (Beautrais, Joyce, & Mulder, 1996; Horesh, Sever, & Apter, 2003). Furthermore, in the community based study by Haavisto et al. (2005) negative life-events were associated with suicide attempts with or without DSH among adolescent boys (Haavisto et al., 2005). However, in the community study by Lewinsohn, Rohde, & Seeley (1996), after controlling for severity of depression, the impacts of major life events, daily hassles, and low support from friends as risk factors for suicidality were not significant (Lewinsohn et al., 1996).

We have previously reported no difference in prevalence of suicidal behaviour among depressed adolescent outpatients with or without comorbid disorders (Tuisku et al., 2006). DSH was common and associated with younger age and poor psychosocial functioning (Tuisku et al., 2006). There is little research on depressive and anxiety symptoms, perceived social support, negative life-events and alcohol use among depressed adolescents with DSH and on how these determinants influence them. It is not known whether depressed adolescents only with DSH differ from those with DSH and other suicidal behaviours.

The aim of the present study was to investigate the role of depressive and anxiety symptoms, perceived social support, negative life-events and alcohol use in deliberate self-harm behaviour among depressed adolescent outpatients by comparing them with non-suicidal depressed adolescent outpatients. A secondary aim was to determine whether depressed adolescents with only DSH but no suicidal intent differ in the above variables from adolescents who have suicidal ideation or suicide attempts in addition to DSH. In the present study the adolescent was defined as having DSH, if she/he had harmed him/herself occasionally or frequently without intent to die.

We expected depressed adolescent outpatients with DSH to have more depressive and anxiety symptoms, to have less perceived social support, to have experienced more negative life-events and to use more alcohol compared with non-suicidal depressed adolescents. Further, as DSH is reportedly a risk factor for suicide, we expected to find no differences in depressive or anxiety symptoms, level of social support, number of negative life-events and use of alcohol among depressed adolescents with only DSH compared to those with DSH accompanied with suicidal ideation or suicide attempt.

## Methods

### *Depressed outpatients*

The present study is part of the Adolescent Depression Study (ADS), a naturalistic clinical research and development project investigating adolescent depressive mood disorders (Karlsson

et al., 2006; Tuisku et al., 2006). The ADS project is a collaboration between the Department of Adolescent Psychiatry of the Peijas Medical Health Care District (PMCD) of Helsinki University Central Hospital and the Department of Mental Health and Alcohol Research of the National Public Health Institute, Helsinki, Finland. The outpatient sample was drawn from the adolescent psychiatric outpatient clinics of the PMCD between February 1st 1998 and December 31st 2001. Of the 660 eligible outpatients, 624 (94.5%) were screened during their first consultation visit with the Beck Depression Inventory (BDI-21) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the General Health Questionnaire-36 (GHQ-36) (Goldberg, 1972). The 373 patients with scores of 10 or more in the BDI-21 and 5 or more in the GHQ-36 were considered screen positive and asked to participate in the study. At this point 118 (31.6%) outpatients refused and 34 (9.1%) dropped out. Refusal/dropping out was unrelated to sex ( $\chi^2 = 2.08$ ,  $df = 1$ ,  $p = 0.15$ ), age group ( $\chi^2 = 2.37$ ,  $df = 1$ ,  $p = 0.12$ ) and parental SES (1 = working class, 2 = lower middle class, 3 = upper middle class, 4 = other) ( $\chi^2 = 5.59$ ,  $df = 3$ ,  $p = 0.13$ ), while it associated with lower BDI-21 (19.0 vs. 21.0,  $z = -1.93$ ,  $df = 371$ ,  $p = 0.05$ ) and lower GHQ-36 (21.0 vs. 24.0,  $z = -1.98$ ,  $df = 367$ ,  $p = 0.05$ ) median sum scores. The 221 remaining outpatients were evaluated by diagnostic interview (Schedule for Affective Disorders and Schizophrenia for School-Aged Children – Present and Life-time, K-SADS-PL) (Kaufman et al., 1997) and 218 were diagnosed as having a current depressive mood disorder. The subjects' mean age was 16.4 (SD 1.6, range 13–19 years): 18% ( $n = 40$ ) were males and 82% ( $n = 178$ ) females. Parental SES was working class in 29%, lower middle class in 37%, upper middle class in 26%, and other in 8% of the depressed patients. In all, 72% ( $n = 157$ ) had one or more Axis I disorder in addition to a mood disorder. Comorbidity with anxiety disorders ( $n = 125$ , 57%) was most common, with 20% ( $n = 43$ ) of the subjects having an anxiety disorder plus at least one other comorbid disorder. Fifteen percent ( $n = 32$ ) had other comorbidity (substance use disorder ( $n = 18$ ), eating disorder ( $n = 6$ ), disruptive disorder ( $n = 12$ )) excluding anxiety disorders (Karlsson et al., 2006).

### *Diagnostic interview*

Nine researchers conducted the diagnostic interviews using the K-SADS-PL, a semi-structured interview with high reliability and validity (Kaufman et al., 1997; Shanee, Apter, & Weizman, 1997), to assess DSM-IV Axis I disorders. All the research diagnoses were confirmed in a subsequent diagnostic meeting. Inter-rater reliability, assessed using 15 randomly selected videotaped interviews, was good for mood disorder diagnoses [weighted kappa (Fleiss & Cohen, 1973; SAS Institute Inc., 1999) for MDD, other mood disorder, no mood disorder 0.87(95% CI 0.81,0.93)]. (Karlsson et al., 2006).

### *Deliberate self-harm behaviour and other suicidality*

Suicidal behaviour was determined using four questions from the screening section of the K-SADS-PL diagnostic interview relating to suicidal thoughts (rating "1" = none, "2" = occasional, "3" = frequent), suicide attempts and their seriousness (rating "1" = none, "2" = ambivalent, "3" = serious), suicide attempts and their lethality (rating "1" = none, "2" = not life-threatening, "3" = life-threatening), and deliberate self-harm behaviour without intent to die (rating "1" = none, "2" = occasional, "3" = frequent).

Based on these questions, two mutually exclusive outpatient subgroups of suicidal behaviour during the current depressive episode were constructed: 1) the “deliberate self-harm behaviour” group included subjects who had occasional or frequent deliberate self-harm. Seventy-three (34%) of the 218 depressed adolescent outpatients were included in this DSH group; 2) the “non-suicidal” group consisted of subjects with no current or previous suicidality rating “1” in all items ( $n = 82$ ). Of the 218 depressed outpatients, 63 were excluded from the analyses of the present study due to current suicidal thoughts ( $n = 33$ ), or previous suicide attempts ( $n = 14$ ) or suicidality ( $n = 16$ ), but without DSH. There were no differences in comorbidity between depressed adolescents with DSH and non-suicidal depressed adolescents ( $\lambda^2 = 0.990$ ,  $df = 1$ ,  $p = 0.320$ ) or between different kind of comorbidity (1. subjects with depressive disorder without comorbidity, 2. subjects with a depressive disorder and an anxiety disorder, 3. subjects with a depressive disorder, an anxiety disorder and other comorbid disorders, and 4. subjects with a depressive disorder and other comorbid disorders excluding anxiety disorders) ( $\lambda^2 = 4.993$ ,  $df = 3$ ,  $p = 0.172$ ).

The deliberate self-harm behaviour group ( $n = 73$ ) was further divided into two subgroups. 1) Adolescents with “deliberate self-harm only” included those with no suicidal thoughts and who had not attempted suicide ( $n = 21$ ), 2) adolescents with “deliberate self-harm behaviour and suicidal ideation or suicide attempt” consisted of adolescents who had DSH and suicidal thoughts frequently ( $n = 14$ ), or had attempted suicide ( $n = 38$ ).

#### *Assessment measures*

Depressive symptoms were assessed using the Beck Depression inventory-21 (BDI-21) (Beck et al., 1961), a standardized 21-item questionnaire widely used in research on adolescent depression (range 0–63) (Brooks & Kutcher, 2001; Myers & Winters, 2002).

Anxiety symptoms were assessed using the Beck Anxiety Inventory (BAI) (Beck, Epstein, Brown, & Steer, 1988), a 21-item self-report measure of anxiety symptoms validated in adolescents (range 0–63) (Beck et al., 1988).

Life-events were assessed using a modified version of the Life-events Checklist (LEC) (Johnson & McCutcheon, 1980), a self-report questionnaire relating to events experienced during one’s lifetime and during the past year. The respondent rates whether or not the event occurred, and whether its impact was positive or negative. The scale has been shown to have sound psychometric properties (Johnsson & Sarason, 1979). In this study the number of negative life-events during the previous year (range 0–26) was used in the analyses.

Alcohol use was assessed using the Alcohol Use Disorders Identification Test (AUDIT) (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), which has been shown to be reliable and valid (Reinert & Allen, 2002). AUDIT is a 10-item questionnaire which covers the domains of current alcohol consumption, drinking behaviour and alcohol-related problems (range 0–40).

Social support was assessed by The Perceived Social Support Scale-Revised (PSSS-R) (Blumenthal et al., 1987), a self-report scale consisting of 12 items rated on a five-point Likert-type format ranging from totally disagree (1) to totally agree (5). Previous research on the PSSS-R has identified three separate but correlated factors addressing perceived support from the family (range 0–20), from a significant other (range 0–20) and from friends (0–20). The PSSS-R has demonstrated good internal reliability and adequate stability (Blumenthal et al., 1987). A higher score indicates a higher level of perceived social support.

In data analyses the sum scores of the BDI-21, BAI, AUDIT, and the three PSSS-R sub-scales were treated as continuous variables.

### Data analyses

SPSS 14.0 software was used in data analyses (SPSS Inc., 2005). The group comparisons for categorical variables were analyzed using the Chi Square and Fisher's Exact test. Non-parametric Mann–Whitney *U* test was applied to comparisons in non-normally distributed continuous variables (BDI-21, BAI, the three PSSS-R sub-scales, AUDIT). Multivariate logistic regression analysis was performed, depressed adolescents with DSH as the dependent variable (depressed adolescents with DSH vs. non-suicidal depressed adolescents). The significant variables in bivariate analyses were entered into the model. *P*-values <0.05 and odds ratios (OR) with lower 95% confidence intervals (95% CI) >1 were considered statistically significant.

### Results

There were no statistically significant differences in gender or in mean age between depressed adolescents with DSH, and depressed non-suicidal adolescents (Table 1). Neither were there age differences between adolescents with DSH only, or with DSH and suicidal ideation or suicide attempts. Three-fourths of females with DSH also had other suicidal behaviour, while among males the percentage was only 30% (Table 2).

### Bivariate group comparisons

Depressed adolescents with DSH had significantly more depressive symptoms, higher AUDIT scores, and less perceived support from the family than non-suicidal depressed adolescents (Table 1).

Table 1

Characteristics of depressed adolescent outpatients with deliberate self-harm and depressed non-suicidal adolescent outpatients.

	Depressed adolescents with deliberate self-harm ( <i>n</i> = 73)	Depressed non-suicidal adolescents ( <i>n</i> = 82)	<i>p</i>
Females, <i>N</i> (%)	63 (86.3)	64 (78.0)	0.183
Age, mean (SD)	15.9 (1.7)	16.4 (1.5)	0.072
Parental divorce, <i>N</i> (%)	31 (42.5)	30 (36.6)	0.454
Depressive symptoms, mean (SD)	24.1 (10.1)	19.5 (7.8)	0.003
Anxiety symptoms, mean (SD)	23.4 (12.0)	20.1 (11.7)	0.059
Social support			
Family support, <sup>a</sup> mean (SD)	11.4 (4.6)	14.8 (4.2)	<0.001
Friend support, <sup>a</sup> mean (SD)	15.2 (4.2)	16.2 (3.8)	0.142
Significant other, <sup>a</sup> mean (SD)	16.6 (3.9)	17.3 (3.5)	0.186
Alcohol use (AUDIT), mean (SD)	9.3 (7.7)	5.6 (5.8)	0.001
Number of negative life-events, previous year, mean (SD)	2.8 (2.2)	2.3 (2.4)	0.069

<sup>a</sup> Higher score = more support.

Table 2

Characteristics of depressed adolescent outpatients with deliberate self-harm with and without other suicidality.

	Deliberate self-harm only ( <i>n</i> = 21)	Deliberate self-harm with suicidal ideation or suicide attempt ( <i>n</i> = 52)	<i>p</i>
Females, <i>N</i> (%)	14 (66.7)	49 (94.2)	0.002
Age, mean (SD)	15.8 (1.5)	15.9 (1.8)	0.692
Parental divorce, <i>N</i> (%)	10 (47.6)	21 (40.4)	0.571
Depressive symptoms, mean (SD)	18.8 (7.3)	26.2 (10.4)	0.004
Anxiety symptoms, mean (SD)	18.8 (10.9)	25.2 (12.0)	0.032
Social support			
Family support, <sup>a</sup> mean (SD)	12.2 (4.8)	11.0 (4.5)	0.311
Friend support, <sup>a</sup> mean (SD)	14.7 (4.8)	15.3 (4.0)	0.737
Significant other, <sup>a</sup> mean (SD)	16.2 (4.1)	16.7 (3.8)	0.532
Alcohol use (AUDIT), mean (SD)	8.2 (7.1)	9.8 (7.9)	0.489
Number of negative life-events, previous year, mean (SD)	2.3 (1.7)	3.0 (2.3)	0.365

<sup>a</sup> Higher score = more support.

There were no differences in parental divorce, perceived support from friends or from significant others, and number of negative life-events during the previous year between these two groups (Table 1).

Depressed adolescents with DSH and suicidal ideation or suicide attempts had significantly more severe depressive and anxiety symptoms than depressed adolescents with only DSH (Table 2). There were no significant differences in parental divorce, AUDIT scores, perceived support from family, friends or significant others, nor in negative life-events during the previous year between these two groups (Table 2).

### Multivariate analyses

Multivariate logistic regression analyses were conducted in order to find predictor variables associated with DSH. The significant variables in bivariate analyses plus gender and age were entered into the model (Table 1).

In comparison with non-suicidal depressed subjects, low level of perceived support from the family, alcohol use, younger age and depressive symptoms all associated with DSH (Table 3).

Table 3

Odds ratios of predictor variables for deliberate self-harm behaviour.<sup>a</sup>

Predictor	OR	95% CI	<i>p</i>
Gender	1.32	0.45–3.84	0.616
Age	0.78	0.60–0.99	0.048
Depressive symptoms	1.06	1.01–1.11	0.015
Family support	0.89	0.81–0.97	0.011
Alcohol use (AUDIT)	1.09	1.03–1.16	0.005

<sup>a</sup> Depressed adolescents with deliberate self-harm vs. depressed non-suicidal adolescents.

## Discussion

This study is among the few to investigate depressed adolescent outpatients who have deliberately self-harmed, and to compare them to non-suicidal depressed adolescent outpatients. As expected, depressed adolescents with DSH perceived less support from their family, had more severe depressive symptoms and used more alcohol than non-suicidal depressed adolescents. However, the impacts of negative life-events, anxiety symptoms and perceived support from friends and from significant others were not confirmed. Adolescents with DSH and suicidal ideation or suicide attempts had more depressive and anxiety symptoms than adolescents with DSH only.

### *Comparisons between depressed adolescents with DSH and non-suicidal depressed adolescents*

Our finding that depressed adolescents with DSH used more alcohol than non-suicidal depressed adolescents accords with previous research reporting heavy alcohol use to associate with DSH and abundant alcohol use to increase the risk of acts of DSH (Haavisto et al., 2005; Haw, Hawton, Casey, Bale, & Shepherd, 2005). Moreover, adolescents' perception of low family support reportedly associates with alcohol abuse among suicidal inpatients (Kerr et al., 2006).

That depressed adolescents with DSH perceived less support from the family and had more severe depressive symptoms than non-suicidal depressed adolescents seems consistent with previous research. Low parental support and acceptance was reportedly associated with greater severity of depressive symptoms and suicidal ideation in hospitalized adolescents after attempted suicide (Beautrais et al., 1996). Both non-clinical and inpatient adolescents with DSH are reportedly less able to talk to family members or to seek support from their parents compared with their peers (Evans et al., 2004; Groholt, Ekeberg, & Haldorsen, 2000). A recent study suggests that inadequate family support is particularly deleterious to adolescents' psychosocial functioning (Kerr et al., 2006). The fact that the family provides multiple functions and is a vital developmental context during adolescence explains why deficiency in family support is a significant risk factor among depressed adolescents with DSH, as previous research on suicidal adolescents also suggests (Kerr et al., 2006).

In our study depressed adolescents with DSH and non-suicidal depressed adolescents had an equally low perception of social support from their friends. As peers have an increasing influence during adolescence it is not surprising that failure to develop adequate peer relationships is associated with depression. This accords with previous studies reporting greater support from peers to be related to less severe depression and suicidal ideation (Cumsille & Epstein, 1994; Prinstein, Boergers, Spirito, Little, & Grapentine, 2000). Moreover, in the study by Evans, Hawton, and Rodham (2005) non-clinical adolescents with DSH had fewer people whom they felt able to talk to about things that really bothered them, compared to their peers (Evans et al., 2005).

There is little detailed information on negative life-events and depressed adolescents with DSH. Our hypothesis that depressed adolescents with DSH would have more negative life-events than depressive non-suicidal adolescents was not supported. In line with our findings, negative life-events associated independently with suicidal tendencies, though not after controlling anxious and depressive symptoms in a non-clinical study (Haavisto et al., 2005). The findings of this study seem to parallel prior research indicating that recent life-events may have a less important role in adolescent suicide victims with severe depressed mood (Cooper, Appleby, & Amos, 2002).

### *Depressed adolescents with DSH with and without additional suicidality*

DSH, unlike attempted suicide, is a somewhat controversial issue in suicide research. Although most previous researchers understand DSH and suicide attempts as distinct behavioral phenomena, DSH is reportedly a significant risk factor for suicide attempts (Nock et al., 2006). Between a quarter and a half of those committing suicide have previously carried out DSH (Hawton & James, 2005) and in line with our findings, DSH and suicide attempts often co-occur (Nock et al., 2006; Skegg, 2005).

In the present study, depressed adolescents with DSH and suicidal ideation or suicide attempts had more depressive and anxiety symptoms than adolescents with only DSH. In the study of Groholt et al. (2000) depressive symptoms were prevalent in DSH adolescents regardless of intent to die. However, the samples are not fully comparable since adolescents in the Groholt study were inpatients with medically severe DSH acts, while the present study subjects were depressed adolescent outpatients with deliberate self-harm behaviour. In a recent study that accords with our finding, adolescents with DSH and suicide attempts had slightly higher levels of depressive symptoms than adolescents with only DSH among a community sample of adolescents (Muehlenkamp & Gutierrez, 2007). In addition, anxiety and depressive symptoms associated with suicide attempts with or without DSH in a community sample of adolescent boys (Haavisto et al., 2005). Severity of depressive and anxiety symptoms may increase the risk of attempting suicide in adolescents with DSH. For this reason adolescents who experience significant internalizing distress symptoms are at risk not only for DSH, but also for additional suicidal behaviour.

From a theoretical viewpoint, DSH is often conceptualized as an emotion regulation strategy, suggesting that individuals engaged in DSH are motivated to live but have difficulty coping with distress (Nock & Prinstein, 2004). Joiner (2005) has proposed a model of suicide in which practising DSH over time habituates an individual to self harm, a mechanism which increases the risk for suicide attempts because of habituation to the fears and physical pain associated with DSH (Joiner, 2005). Subjects with only DSH in this study had less anxiety and depressive symptoms than adolescents with DSH and other suicidality. Unfortunately, our study design precluded the possibility of assessing whether they had used DSH as an emotion regulating strategy and if by habituating to physical pain, they were at increased risk for further suicidal behaviour. This possibility of a relationship between DSH and suicide emphasizes the need for follow-up studies to clarify indicators of risk of DSH progressing to attempted suicide.

In line with previous research reporting that youths with DSH were carrying a heavy burden of problems whether or not they had intent to die (Groholt et al., 2000), we found low level of perceived family support and alcohol use to be common among all depressed adolescents with DSH whether or not they also had suicidal ideation or suicide attempts.

### *Strengths and limitations*

The present study included depressed adolescents, whose DSH, suicide attempts and suicidal ideation were comprehensively assessed using a reliable interview instrument and self-report scales. On the other hand, since the sample was drawn from depressed adolescent outpatients with DSH the generalizability of our findings to non-clinical populations may be limited. Generalization to other cultures should be made with the understanding of possible differences between

health care systems. Unfortunately, information about the severity and perceived lethality of DSH was not collected.

It is a weakness that a relatively large number of positively screened subjects dropped out. As drop-outs or those refusing to participate scored lower on the screening instruments, the subjects of this study represent those with more severe depression than those lost to attrition. This may affect our relatively high DSH rates. The cross-sectional nature of the present study precludes causal conclusions.

Due to the small sample size data on adolescents having DSH with suicidal ideation and with suicide attempts were combined. Previous research suggests that suicidal ideation and suicide attempts can be conceptualized as manifestations of the same phenomenon (Pelkonen, Marttunen, Pulkkinen, Laippala, & Aro, 1997). Small cell sizes precluded multivariate analyses of the characteristics of adolescents with DSH only and those with DSH and suicidal ideation and suicide attempts. Finally, since the study sample was predominantly female we had little power to detect gender differences.

### *Clinical implications*

The rate of DSH is relatively high among depressed adolescent outpatients and it often co-occurs with suicidal ideation and suicide attempts. Any lack of lethal intent, or inconsistency in the adolescent's report of suicidal behaviour and intent, should not reduce efforts to offer help to young people who harms themselves.

Our finding that depressed adolescents with DSH perceived less support from the family compared with non-suicidal depressed adolescents suggests that family interventions may be needed in the treatment of these adolescents. Furthermore, in order to prevent escalation of suicidal behaviour, the finding that severe depressive and anxiety symptoms and use of alcohol increased the risk of DSH acts would be important to clinicians treating depressed adolescents. Obviously, follow-up studies are needed to clarify the predictive impact of DSH among depressed adolescents.

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Research report

## Depressed adolescents as young adults – Predictors of suicide attempt and non-suicidal self-injury during an 8-year follow-up



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### ABSTRACT

**Background:** Clinically derived follow-up studies examining the predictors of suicide attempts (SA) and non-suicidal self-injury (NSSI) among adolescents are scarce. The aims were to study SA and NSSI as predictors of future NSSI and SA, and to study the role of other risk and protective factors, especially alcohol use, and perceived social support from family and peers during a 1-year follow-up and between the 1-year and 8-year follow-ups among consecutively referred depressed adolescent outpatients.

**Methods:** The Adolescent Depression Study (ADS) is a longitudinal study of depressed adolescent outpatients (mean age at baseline 16.5 years, 81.8% females). The subjects of the present study ( $n=139$ , 63.8% of the original study population) were assessed at baseline, at 1-year and 8-year follow-ups using semi-structured diagnostic interviews (K-SADS-PL) for DSM-IV diagnoses, and structured self-report scales for clinical risk factors.

**Results:** In multivariate comparisons, SAs were predicted both in the 1-year follow-up and in the period between the 1- and 8-year follow-ups by alcohol use and low perceived peer support. NSSI in the 1-year of follow-up was predicted by baseline NSSI, younger age and alcohol use, whereas the only significant predictor for NSSI between the 1- and 8-year follow-ups was NSSI.

**Limitations:** A large majority of the sample were females, limiting the possibility to analyze gender differences.

**Conclusions:** Among depressed outpatients NSSI is a strong predictor of suicidal behavior, and other factors beyond depression, such as alcohol use and availability of social support, must also be addressed to prevent the recurrence of suicidal behavior.

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### 1. Introduction

Suicide attempts (SA) and non-suicidal self-injury (NSSI) are major public health concerns among adolescents. NSSI, defined as direct and deliberate destruction of body tissue in the absence of any observable intent to die (e.g. cutting and burning), is more common among adolescents than SA (Nock, 2010; Ougrin et al., 2012). In clinically referred populations NSSI is more frequent and severe than in community samples, also being associated with more severe psychopathology (Nock, 2010). However, NSSI is studied much less than suicide and SA (Pelkonen et al., 2011; Wilkinson et al., 2011). In addition, much of the research on NSSI does not include separate categories for NSSI and SA, thus failing to distinguish SA with clear intent to die from NSSI without suicidal intent.

NSSI appears to be cross-sectionally associated with SA and to predict future SA and suicides in adults (Brunner et al., 2007; Nock

et al., 2006). Among adolescents, prospective studies show a substantial risk of suicide after self-harm that results in hospital presentation (Hawton et al., 2012). In retrospective life-course studies early self-harm is not uncommon in those who die by suicide in late adolescence or early adulthood (Hawton et al., 2012). In the Treatment of SSRI-resistant Depression in Adolescents study (TORDIA), NSSI predicted both incident SA and NSSI, whereas baseline SA was not a significant predictor of SA during the 24-week follow-up (Asarnow et al., 2011). Further, in the Adolescent Depression, Antidepressants and Psychotherapy Trial study (ADAPT), NSSI predicted both NSSI and SA in the 28-week follow-up (Wilkinson et al., 2011). Whether NSSI predicts future suicide/SA and NSSI when adolescents mature to young adulthood warrants further longitudinal research.

Despite the observed similarities between NSSI and SA the risk factors are not necessarily identical (Cox et al., 2012). Previous research indicates that a history of NSSI or SA in adolescents was related to a wide range of risk factors, such as depressive and anxiety symptoms, substance use, poor family support, problems in friendship, and histories of abuse (Brunner et al., 2007; Cox et al., 2012; Fergusson et al., 2003; Muehlenkamp and Gutierrez, 2007; Wilkinson et al., 2011). However, adolescents with NSSI

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have been younger than adolescents with SA (Cox et al., 2012) suggesting that NSSI has an earlier onset than SA. Adolescents with SA have had higher levels of disadvantageous familial characteristics, impaired family function, and family history of suicide (Cox et al., 2012; Fergusson et al., 2003; Wilkinson et al., 2011) than those with NSSI. The significance of mood disorders in adolescent suicidal behavior is well-known, while substance use has received somewhat less attention. Reportedly, one third of adolescent psychiatric inpatients, with a history of NSSI had a diagnosis of alcohol abuse or alcohol dependence (Nock et al., 2006), while alcohol use is prospectively associated with SA and NSSI in adolescents (Cooper et al., 2005; Skarbo et al., 2006).

The vulnerability factors can be further moderated by the presence of resilience or protective factors such as social support (Nock et al., 2006). Although the significance of family as a source of support decreases during adolescent development, social support from parents seems to have the most efficient effect in buffering adolescents against depression (Lewinsohn et al., 2001). In addition, in depressed adolescent samples, low support from family continues to predict suicidality in adulthood (Lewinsohn et al., 2001). The influence of friendships increases dramatically during adolescence (Winterrowd et al., 2011), however, peer relationships and poor perceived social support from friends has been identified longitudinally in only a few studies (Fergusson et al., 2003; Prinstein et al., 2001; Wilkinson et al., 2011). Some studies using clinical and general population samples have found that having unsupportive friends may be worse for adolescent wellbeing than having no friends at all (Prinstein et al., 2001, 2000).

Clinically derived follow-up studies examining the continuity and predictors of NSSI and SA among adolescents are still scarce (Asarnow et al., 2011; Fliege et al., 2009). Using a naturalistic clinical sample, this study adds to these existing data by reporting the prevalence of NSSI and SA and their predictors longitudinally among depressed adolescents as they reach adulthood. The Adolescent Depression Study (ADS) is a prospective naturalistic clinical research and development project investigating adolescent depressive mood disorders during 8 years of follow-up. We have previously reported how alcohol use and mood disorder with Axis I comorbidity at baseline predicted suicidal ideation, SA and NSSI among depressed adolescents during the 1-year follow-up (Tuisku et al., 2012). We now extend these results and concentrate on the progression and clinical predictors of NSSI and SA in the short term at the 1-year follow-up and in the longer term in the period between the 1- and 8-year follow-ups among depressed adolescents. The specific aims of this study are as follows: (1) to study NSSI and SA as predictors of future NSSI and SA and (2) to study the role of other risk and protective factors, especially alcohol use, and perceived social support from family and peers.

Based on prior research we expected that prior NSSI would predict both future NSSI and SA. We also expected that alcohol problems and low perceived social support from family and friends would predict NSSI and SA.

## 2. Method

The present study is part of the Adolescent Depression Study (ADS), a naturalistic clinical research and development project investigating adolescent's depressive mood disorders. More detailed descriptions of the participants, assessments and outcomes are available elsewhere (Karlsson et al., 2008, 2006).

### 2.1. Participants

Participants were recruited from the adolescent outpatient clinics in the Peijas Medical Health Care District (PMCD) in southern

Finland between February 1st 1998 and December 31st 2001. Consecutively referred adolescent (aged 13–19 years) outpatients were screened for depressive disorders using the Beck Depression Inventory (BDI) (Beck et al., 1961) and the General Health Questionnaire-36 (GHQ) (Goldberg, 1972). The screen positives (BDI  $\geq 10$  and GHQ  $\geq 5$ ) willing to participate in the study were interviewed using the Schedule for Affective Disorders and Schizophrenia for School-Aged Children – Present and Life-time (K-SADS-PL) (Kaufman et al., 1997), a semi-structured interview with high reliability and validity to assess DSM-IV Axis I disorders. The diagnostic interviews were conducted by trained researchers who were also experienced clinicians. The 218 adolescents diagnosed as having a current depressive mood disorder formed the original adolescent outpatient study population. Written informed consent was obtained from the participants and also from their legal guardians where participants were aged less than 18. The study protocol was accepted by the Ethics Committees of Helsinki University Central Hospital and the Department of Adolescent Psychiatry of the PMCD.

After the baseline evaluation the adolescent outpatients were re-evaluated approximately 1 year ( $n=189$ ) and 8 years later ( $n=148$ ) with structured diagnostic interviews (K-SADS-PL at the 1-year follow-up, SCID-I (First et al., 1996) at the 8 year follow-up) and self-report scales. The median time interval between baseline and the follow-up evaluation was 12.5 months (interquartile range 0.9) and 97.4 months (interquartile range 18.3) for the 1-year and 8-year follow-ups, respectively. Those subjects who participated in both the 1-year and 8-year follow-ups ( $n=137$ ) were included in the present study. There were two completed suicides (a female participant who completed suicide before and a male participant who completed suicide after the 1-year follow-up) during the 8-year study period and data on these adolescents were included in the analyses when possible, so the total  $n$  for study was 139. Those lost to attritions ( $n=79$ , 36%) did not differ from the study participants ( $n=139$ ) in terms of sociodemographic factors (sex  $\chi^2=0.033$ ,  $df=1$ ,  $p=0.857$ ; age  $t=-1.188$ ,  $df=216$ ,  $p=0.236$ ; parental SES  $\chi^2=2.78$ ,  $df=3$ ,  $p=0.426$ ), depressive symptoms (BDI-sumscore  $t=-1.469$ ,  $df=216$ , and  $p=0.143$ ), or prevalences of SA ( $\chi^2=1.089$ ,  $df=1$ , and  $p=0.297$ ) or NSSI ( $\chi^2=0.213$ ,  $df=1$ , and  $p=0.644$ ) at baseline (for definitions of SA and NSSI, see “Measures” below).

As the study was naturalistic, the outpatients received “treatment as usual” of a clinically defined duration in a general adolescent psychiatric setting within Finnish secondary health care (Karlsson et al., 2008). When they were 19 years old, they were able to contact adult psychiatric services, if they needed psychiatric treatment. Up to the 1-year follow-up, 60% of the 139 adolescents received psychiatric medication, all received individual appointments and 49% received at least one family counseling appointment. Up to the 1-year follow-up, 46% of the outpatients had continued the treatment. Between the 1-year and 8-year follow-ups, 62% had received psychiatric medication and 80% individual appointments. Twenty five (19%) of the 139 adolescents had received psychiatric inpatient treatment between the 1-year and 8-year follow-ups.

### 2.2. Measures

Suicide attempts (SA) were defined as an intentional action to end life (Nock et al., 2006) and were measured with two questions from the screening section of the K-SADS-PL diagnostic interview relating to their seriousness (1=none, 2=ambivalent, and 3=serious), and lethality (1=none, 2=not life threatening, and 3=life-threatening). Those attempts with a seriousness of “3” and/or a lethality rating of “2” or “3” were considered as SAs in this study. NSSI was defined as direct and deliberate destruction of body tissue in the absence of any observable intent to die (Nock,

2010). NSSI was assessed by the K-SADS-PL question “Non-suicidal Physical Self-Damaging Acts” (1=none, 2=occasional, and 3=frequent) and those rated as having occasional or frequent NSSI were included in this category. For the analyses SA and NSSI variables were constructed for baseline (referring to current depressive episode, from onset to baseline assessment), for the period from baseline to one year (short-term follow-up) and for the period from 1 to 8 years (long-term follow-up). The questions regarding self-injurious behaviors from the K-SADS-PL were administered also at the long-term follow-up, although the diagnostic instrument itself was changed to the SCID-I interview.

Depressive symptoms were assessed using the Beck Depression Inventory-21 (BDI-21)(Beck et al., 1961), a standardized 21-item questionnaire, and a well-studied screen for youthful depression (Brooks and Kutcher, 2001; Myers and Winters, 2002). In this study population the reliability of the scale as measured by Cronbach's alpha was 0.81 at baseline. Anxiety symptoms were assessed using the Beck Anxiety Inventory (BAI) (Beck et al., 1988). The Beck Anxiety Inventory is a 21-item self-report measure of anxiety symptoms, validated both in adults and adolescents (Beck et al., 1988). Cronbach's alpha for BAI at baseline was 0.91. Perceived social support was assessed using the family and friend subscales from the Perceived Social Support Scale-Revised (PSSS-R) (Blumenthal et al., 1987). Both subscales have four items rated on a five-point (1–5) Likert scale resulting in the theoretical ranges of 4–20 with higher scores indicating higher levels of support. PSSS-R has been validated in adolescents (Arslan, 2009). At baseline the Cronbach's reliability coefficients in this study population were 0.93 and 0.92 for the family and friend subscales, respectively. Alcohol use was assessed by using the sum score of the Alcohol Use Disorders Identification Test (AUDIT) (Reinert and Allen, 2002; Saunders et al., 1993). AUDIT is a 10-item questionnaire which covers the domains of current alcohol consumption, drinking behavior and alcohol-related problems, with higher score (range 0–40) indicating higher level of alcohol use and/or alcohol related problems. AUDIT has been reported to have good psychometric properties also in adolescents (Santis et al., 2009). Cronbach's alpha for AUDIT at baseline was 0.90 in this study population. All self-report scales were administered both at baseline and at both follow-ups.

### 2.2.1. Statistical analysis

Predictors of SA and NSSI were analyzed in two phases: (1) using baseline variables to predict SA and NSSI up to the 1-year follow-up and (2) using variables from the 1-year assessment to predict SA and NSSI in the period between the 1-year and 8-year follow-ups. First, univariate analyses were done with one predictor variable at a time. Multivariate analyses were then done using hierarchical logistic regression and variables were entered into the regression equations in the following order: (step 1) age and gender, SA, NSSI; (step 2) depressive symptoms (BDI), anxiety symptoms (BAI); (step 3) alcohol use (AUDIT); and (step 4) perceived social support from the family (PSSS-R family); and from friends (PSSS-R friends). Variables used in the univariate analyses were checked for multicollinearity using variance inflation factors (VIF) before being entered into the multivariate analyses; all VIF values were below three, so there were no indications of serious multicollinearity among the predictor variables (Field, 2005). *P*-values < 0.05 were considered statistically significant and for odds ratios (OR), 95% confidence intervals (95% CI) were calculated.

## 3. Results

### 3.1. Prevalence of NSSI and suicide attempts

The proportion of adolescents with NSSI declined from 32% at baseline to 22% during the 1-year and to 16% between the 1-year

and 8-year follow-ups (Table 1). Similarly the prevalence of SA dropped from 21% at baseline to 14% during the 1-year and 12% between the 1-year and 8-year follow-ups (Table 1).

There was a significant association between NSSI and SA at baseline, (NSSI present: SA in 24/45 [53%]; NSSI absent: SA in 6/94 [6%];  $\chi^2=39.64$ ,  $df=1$ ,  $p < 0.000$ ). In addition, the association between NSSI and SA from baseline to 1-year was statistically significant (NSSI present: SA in 15/30 [50%]; NSSI absent: SA in 4/108 [4%];  $\chi^2=42.39$ ,  $df=1$ ,  $p < 0.000$ ).

Both completed suicides were preceded by NSSI at baseline and the female participant also had a history of SA at baseline.

### 3.2. Predictors of SA up to the 1-year follow-up

In the univariate analyses SA and NSSI at baseline, depressive and anxiety symptoms, and alcohol use predicted SA during the 1-year follow-up (Table 2).

In the first step of the hierarchical multiple regression analyses the baseline SA was a significant risk factor for SA (step 1). Adding depressive and anxiety symptoms to the model did not affect this (step 2), whereas after adding alcohol use to the model (step 3) the effect of SA at baseline attenuated to non-significant. In the final model (step 4) alcohol use and low perceived social support from friends predicted SA (Table 2).

### 3.3. Predictors of SA between the 1-year and 8-year follow-ups

In univariate analyses female sex appeared as a protective factor against SA between the 1-year and 8-year follow-ups, while SA and NSSI during the 1-year follow-up, alcohol use and low support from friends were risk factors for it (Table 3).

In the first step of the multivariate regression analysis male sex and NSSI were significant risk factors for SA while SA was not (step 1). Depressive and anxiety symptoms had no effect on this (step 2), but adding alcohol use to the model (step 3) also changed the effect of NSSI to non-significant. In the final model (step 4), alcohol use and low perceived social support from friends were the two significant risk factors of SA in the period between the 1-year and 8-year follow-ups (Table 3).

### 3.4. Predictors of NSSI up to the 1-year follow-up

In the univariate analyses, younger age, NSSI and SA at baseline, anxiety symptoms and alcohol use predicted NSSI in the 1-year follow-up (Table 4).

In hierarchical multiple regression models NSSI at baseline predicted NSSI in every step of the analyses (Table 4). Also alcohol

**Table 1**  
Means and percentages of used measures by study panel.

Variable	Baseline <i>n</i> = 139	1-Year follow-up <i>n</i> = 138	8-Year follow-up <i>n</i> = 137
Sex, females, % ( <i>n</i> )	81.3 (113)		
Age, mean (SD)	16.5 (1.59)		
Suicide attempt, % ( <i>n</i> )	21.6 (30)	14.4 (20) <sup>a</sup>	12.3 (17) <sup>b</sup>
NSSI, % ( <i>n</i> )	32.4 (45)	21.7 (30) <sup>a</sup>	16.1 (22) <sup>b</sup>
BDI, mean (SD)	23.1 (8.72)	9.2 (9.33)	7.8 (8.8)
BAI, mean (SD)	22.7 (12.43)	9.2 (9.06)	8.3 (9.2)
AUDIT, mean (SD)	7.9 (7.63)	7.2 (6.60)	7.1 (6.9)
PSSS-R, family, mean (SD)	12.9 (4.66)	14.2 (4.77)	15.8 (4.3)
PSSS-R, friends, mean (SD)	15.2 (4.64)	16.3 (4.10)	16.6 (4.6)

Note: Due to some missing information valid *n* varies from 126 to 139 at baseline, from 134 to 138 at 1-year follow-up, and from 124 to 137 at 8-year follow-up according to measure.

<sup>a</sup> During 1-year follow-up.

<sup>b</sup> During follow-up from 1 to 8 years.

**Table 2**  
Logistic regression analyses predicting suicide attempt during 1-year follow-up. Univariate and hierarchical multivariate analyses.

Variable at baseline	Univariate		Multivariate							
			Step 1		Step 2		Step 3		Step 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex, female	2.27	0.49-10.48	0.97	0.18-5.27	1.03	0.17-6.29	0.86	0.12-5.92	1.07	0.12-9.21
Age	0.78	0.58-1.04	0.95	0.67-1.36	0.92	0.63-1.33	0.86	0.57-1.29	0.84	0.55-1.30
Suicide attempt	<b>8.42</b>	<b>3.02-23.47</b>	<b>5.69</b>	<b>1.47-22.13</b>	<b>5.78</b>	<b>1.32-25.25</b>	3.10	0.61-15.73	4.97	0.70-35.15
NSSI	<b>5.05</b>	<b>1.85-13.78</b>	2.16	0.53-8.83	2.06	0.50-8.54	2.44	0.52-11.42	1.77	0.33-9.58
BDI	<b>1.06</b>	<b>1.00-1.11</b>			0.98	0.90-1.07	0.99	0.90-1.09	0.97	0.87-1.08
BAI	<b>1.04</b>	<b>1.00-1.08</b>			1.05	0.99-1.12	1.04	0.97-1.12	1.03	0.96-1.11
AUDIT	<b>1.11</b>	<b>1.04-1.18</b>					<b>1.11</b>	<b>1.03-1.19</b>	<b>1.13</b>	<b>1.04-1.23</b>
PSSS-R, family	0.91	0.81-1.01							0.95	0.81-1.12
PSSS-R, friends	0.92	0.83-1.02							<b>0.83</b>	<b>0.70-0.98</b>
Change log likelihood (df), <i>p</i>			16.05 (4), <i>p</i> =0.003		2.97 (2), <i>p</i> =0.227		7.71 (1), <i>p</i> =0.005		5.38 (2), <i>p</i> =0.068	
Correctly classified (%)			86.40		88.10		91.50		90.70	

**Table 3**  
Logistic regression analyses predicting suicide attempt during follow-up from 1 to 8 years. Univariate and hierarchical multivariate analyses.

Variable at 1-year follow-up	Univariate		Multivariate							
			Step 1		Step 2		Step 3		Step 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex, female	<b>0.27</b>	<b>0.09-0.79</b>	<b>0.13</b>	<b>0.03-0.50</b>	<b>0.13</b>	<b>0.03-0.53</b>	<b>0.14</b>	<b>0.03-0.61</b>	0.32	0.06-1.75
Age	1.10	0.79-1.53	1.35	0.90-2.02	1.36	0.90-2.06	1.36	0.90-2.06	1.25	0.80-1.93
Suicide attempt <sup>a</sup>	<b>4.53</b>	<b>1.44-14.30</b>	1.56	0.30-8.12	1.94	0.34-11.03	2.15	0.35-13.38	1.44	0.21-9.75
NSSI <sup>a</sup>	<b>7.21</b>	<b>2.45-21.21</b>	<b>10.05</b>	<b>2.18-46.32</b>	<b>9.01</b>	<b>1.79-45.29</b>	4.99	0.87-28.69	3.43	0.50-23.53
BDI	1.01	0.96-1.07			0.95	0.87-1.04	0.96	0.88-1.05	0.94	0.84-1.04
BAI	1.04	0.98-1.09			1.07	0.98-1.18	1.04	0.94-1.14	1.03	0.92-1.14
AUDIT	<b>1.16</b>	<b>1.07-1.25</b>					<b>1.12</b>	<b>1.01-1.24</b>	<b>1.22</b>	<b>1.06-1.40</b>
PSSS-R, family	1.00	0.90-1.12							1.09	0.93-1.28
PSSS-R, friends	<b>0.86</b>	<b>0.77-0.96</b>							<b>0.78</b>	<b>0.64-0.95</b>
Change log likelihood (df), <i>p</i>			22.17 (4), <i>p</i> <0.001		2.16 (2), <i>p</i> =0.341		5.00 (1), <i>p</i> =0.025		7.63 (2), <i>p</i> =0.022	
Correctly classified (%)			89.50		91.00		90.20		91.70	

<sup>a</sup> During 1-year follow-up.

use was a significant predictor of NSSI when it was added to the model in step 3. In the final model (step 4), where perceived social support from the family and from friends were added to the model, it was found that younger age, NSSI and alcohol use at baseline predicted NSSI in the 1-year follow-up (Table 4).

### 3.5. Predictors of NSSI between the 1-year and 8-year follow-ups

In the univariate analyses, it was found that NSSI, anxiety symptoms and alcohol use predicted NSSI in the period between the 1-year and 8-year follow-ups (Table 5).

In the hierarchical regression analysis, NSSI was the only significant predictor of NSSI and adding other predictors to the model did not change its effect remarkably: the OR of 7.2 in step 1 dropped to 5.6 in the final model in step 4 (Table 5).

## 4. Discussion

In this 8-year prospective clinical study we reported the prevalence rates and selected risk factors for SA and NSSI among consecutively referred adolescent outpatients both in short-term and long-term follow-ups. The prevalence of both SA and NSSI declined over time as the adolescents reached young adulthood. NSSI seemed to be the sole risk factor for later NSSI and also a strong risk factor for later SA, possibly stronger than SA itself. In the multivariate analyses, adolescent alcohol use emerged as the

strongest risk factor for later SA, and perceived peer support was associated inversely with the risk of SA.

During the 1-year follow-up both NSSI and SA predicted both SA and NSSI in the univariate analyses. When both of them were included in the model, only SA predicted SA and NSSI was the most powerful predictor of NSSI. Our study is one of the few longitudinal studies to examine the association between NSSI and SA when depressed adolescents grow up and reach adulthood. When including both SA and NSSI in the model for the period between 1-year and 8-year follow-ups, only NSSI predicted future SA. Interestingly, in the long-term analyses of NSSI, only NSSI predicted future NSSI, whereas SA had no predictive value for NSSI in either the univariate or multivariate models. During 8-year follow-up, there were two suicides and they both had NSSI at baseline. The finding that NSSI was a strong predictor of SA, perhaps even stronger than SA itself, was consistent with reports from ADAPT (Wilkinson et al., 2011) and TORDIA (Asarnow et al., 2011) studies. Thus reproducing the same result in a considerably longer follow-up period our study provided further evidence for this finding.

Our result of NSSI predicting future NSSI in both the shorter and longer follow-up and also predicting future SA in the longer follow-up may clarify more of the spectrum of non-suicidal self-harm. Although not investigated here, it can be argued that youth with suicidal behavior could have emotion regulation deficits. NSSI may fail to produce sufficient relief (intrapersonal and/or interpersonal effects), and vulnerable youths may turn to SA (Asarnow et al., 2011). Another possibility is that engaging in NSSI desensitizes youths to

**Table 4**

Logistic regression analyses predicting NSSI during 1-year follow-up. Univariate and hierarchical multivariate analyses.

Variable at baseline	Univariate		Multivariate							
			Step 1		Step 2		Step 3		Step 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex, female	1.66	0.53-5.26	1.15	0.32-4.15	1.14	0.27-4.77	1.08	0.25-4.62	1.33	0.29-6.14
Age	<b>0.72</b>	<b>0.55-0.93</b>	0.8	0.59-1.09	0.77	0.57-1.05	0.73	0.53-1.01	<b>0.70</b>	<b>0.50-0.98</b>
Suicide attempt	<b>5.43</b>	<b>2.20-13.36</b>	2.23	0.73-6.89	2.08	0.64-6.73	1.5	0.43-5.24	1.69	0.46-6.23
NSSI	<b>7.00</b>	<b>2.89-16.95</b>	<b>3.53</b>	<b>1.23-10.10</b>	<b>3.58</b>	<b>1.22-10.49</b>	<b>3.58</b>	<b>1.19-10.71</b>	<b>4.25</b>	<b>1.34-13.51</b>
BDI	1.03	0.98-1.08			1.00	0.93-1.07	1.00	0.93-1.07	1.00	0.93-1.08
BAI	<b>1.04</b>	<b>1.00-1.07</b>			1.04	0.99-1.09	1.04	0.99-1.09	1.04	0.98-1.09
AUDIT	<b>1.06</b>	<b>1.01-1.12</b>					<b>1.06</b>	<b>1.00-1.13</b>	<b>1.07</b>	<b>1.00-1.14</b>
PSSS-R, family	1.00	0.92-1.10							1.11	0.98-1.25
PSSS-R, friends	1.00	0.91-1.09							0.98	0.87-1.10
Change log likelihood (df), <i>p</i>			20.88 (4), <i>p</i> < 0.001		3.60 (2), <i>p</i> = 0.165		3.72 (1), <i>p</i> = 0.054		2.85 (2), <i>p</i> = 0.240	
Correctly classified (%)			78.60		79.50		79.50		82.10	

**Table 5**

Logistic regression analyses predicting NSSI during follow-up from 1 to 8 years. Univariate and hierarchical multivariate analyses.

Variable at 1-year follow-up	Univariate		Multivariate							
			Step 1		Step 2		Step 3		Step 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex, female	0.72	0.24-2.17	0.73	0.21-2.60	0.71	0.19-2.70	0.69	0.18-2.69	0.52	0.12-2.31
Age	0.92	0.69-1.22	1.11	0.81-1.54	1.08	0.78-1.50	1.08	0.78-1.51	1.02	0.72-1.44
Suicide attempt <sup>a</sup>	2.12	0.68-6.66	0.54	0.12-2.38	0.63	0.14-2.88	0.63	0.14-2.88	0.79	0.16-3.80
NSSI <sup>a</sup>	<b>5.05</b>	<b>1.92-13.33</b>	<b>7.2</b>	<b>2.12-24.50</b>	<b>6.11</b>	<b>1.72-21.68</b>	<b>6.49</b>	<b>1.63-27.51</b>	<b>5.55</b>	<b>1.34-22.90</b>
BDI	1.03	0.98-1.08			0.99	0.92-1.06	0.99	0.92-1.06	1.00	0.92-1.08
BAI	<b>1.05</b>	<b>1.00-1.09</b>			1.06	0.99-1.14	1.07	0.99-1.15	1.06	0.98-1.15
AUDIT	<b>1.06</b>	<b>1.00-1.14</b>					0.99	0.91-1.08	1.00	0.92-1.10
PSSS-R, family	1.08	0.97-1.21							1.11	0.97-1.27
PSSS-R, friends	1.00	0.89-1.12							1.04	0.90-1.20
Change log likelihood (df), <i>p</i>			10.75 (4), <i>p</i> = 0.030		3.44 (2), <i>p</i> = 0.179		0.05 (1), <i>p</i> = 0.827		3.07 (2), <i>p</i> = 0.215	
Correctly classified (%)			85.60		85.60		85.60		84.10	

<sup>a</sup> During 1-year follow-up.

self-harm behaviors, thus lowering the barriers to future NSSI and further to SA. This was in line with our results showing that younger age is associated with NSSI. It was possible that NSSI was a predictor of SA because NSSI is an earlier manifestation of vulnerability than SA to mood dysregulation that serves as a potential common diathesis for both NSSI and SA (Brent et al., 2009; Cox et al., 2012). According to Joiner's interpersonal-psychological theory of suicidal behavior (Joiner, 2005) adolescents make serious suicide attempts only if they have the combination of an intention to die and the capability to act on that intention. Repeated NSSI may result in higher pain tolerance and reduced fear of death. These mechanisms would imply that NSSI has an earlier onset than SA and that NSSI behavior may lead to later SA. This doesn't mean that there are no cases where NSSI is preceded by SA, but rather that in such cases there is usually also a history of previous NSSI that took place before SA (Cox et al., 2012). Cases where an adolescent starts with SA and later turns to NSSI might thus be rare.

Compared with NSSI, SA was associated partly with a different pattern of predictors. In particular, alcohol use characterized those with SA across time. Although alcohol use was a risk factor for NSSI in the shorter follow-up evaluation, its impact was attenuated in the longer follow-up. In previous research, alcohol abuse and dependence was a risk factor for NSSI among adolescent inpatients (Nock et al., 2006), and alcohol use was a significant predictor in a univariate analysis, but not in a multivariate model of future NSSI or SA during follow-up among treatment resistant depressed adolescents (Asarnow et al., 2011). In addition, alcohol misuse was a risk factor for SA among adolescent outpatients in a follow-up study

(Skarbo et al., 2006). It is important to distinguish between directly self-injurious behaviors and indirectly harmful behavior (alcohol and substance use); however, these different forms of self-harm commonly co-occur, and it may be useful to consider them on a continuum of self-harm behaviors (Nock, 2010).

In our study, high perceived social support from friends was a protective factor for future SA (though not support from family). Due to the few previous longitudinal studies, and their methodological variations and the different sample characteristics in the previous research, comparisons between our results and other findings may be seen as preliminary. In the ADAPT study, poor family function was a risk factor for future SA in depressed adolescents, whereas problems in personal friendships were not (Wilkinson et al., 2011). However, adolescents in our study were older than adolescents in the ADAPT study and developmentally the importance of peers increases and family influence decreases as adolescence proceeds (Winterrowd et al., 2011). Alcohol use and low perceived support from friends together may impede development when transitioning into adulthood (Prinstein et al., 2001), so it can be speculated, that these adolescents may feel more hopeless and have an intention to die instead of carrying out NSSI.

Consequently, treatments will need to be personalized to target the diverse reinforcement contingencies associated with NSSI, which may be interpersonal in one individual and intrapersonal in another (Brent et al., 2009). In line with previous studies our data demonstrate that the treatment of depression may be insufficient to reduce the risk of further attempts (Brent et al., 2009). In clinical samples NSSI is a strong predictor of suicidal

behavior. In addition, as the findings in TORDIA make clear, NSSI was rarely detected without systematic monitoring (Asarnow et al., 2011), and clinicians should ask about non-suicidal self-injury or any type of self-destructive behavior among depressive adolescents. Other factors beyond depression, such as alcohol use and perceived social support must also be addressed to prevent the recurrence of suicidal behavior.

The strength of this study lies in the use of thorough examination employing structured assessments in a long-term follow-up among consecutively referred depressed adolescent outpatients. The following limitations should be considered when interpreting the results of the study. It cannot be assumed, that our results necessarily apply to non-referred adolescents and young adults with suicidal behavior and NSSI. The attrition rate was substantial, but is unlikely to cause significant bias as those lost to attrition did not differ from the study participants in terms of sociodemographic measures, severity of depression or prevalences of self-harm behaviors. A more detailed assessment of NSSI including the data on repetitive NSSI would have provided additional information. In the longer follow-up data on self-harm were collected only at the time of the 8-years follow-up assessment, which may have led to underestimation of self-harm events in the period between the 1-year and 8-year follow-ups. The sample size was relatively small and a large majority of the sample was females, limiting the possibility to analyze gender differences. We used self-report scales to assess e.g. alcohol use, and our results may be an underestimation of alcohol problems. We also used a self-report assessment for perceived social support and if we had had data for example on the quality of peer relationships and familiar characteristics, it would have provided more specific knowledge on these risk factors.

Depressed adolescents with NSSI require the same high level of urgent assessment and treatment as those who have made an SA. Furthermore, depression treatment may need supplementation with interventions targeting specific risk factors for SA and NSSI, such as deficits in friendships and alcohol use.

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#### Conflict of interest

The authors report that they have no financial relationships with commercial interest.

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