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Anu-Helmi Luukkonen

BULLYING BEHAVIOUR IN RELATION TO PSYCHIATRIC DISORDERS, SUICIDALITY AND CRIMINAL OFFENCES

A STUDY OF UNDER-AGE ADOLESCENT INPATIENTS IN NORTHERN FINLAND

FACULTY OF MEDICINE,
INSTITUTE OF CLINICAL MEDICINE,
DEPARTMENT OF PSYCHIATRY,
UNIVERSITY OF OULU;
DEPARTMENT OF PSYCHIATRY,
OULU UNIVERSITY HOSPITAL

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A study of under-age adolescent inpatients in Northern Finland

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Abstract

Bullying behaviour is present in the daily life of many adolescents, but research into the serious problems related to this behaviour is still scarce. The aim of this work was to investigate the putative associations of bullying behaviour with psychiatric disorders, substance use, suicidality and criminal offences in a sample of under-age adolescent inpatients in Northern Finland.

The epidemiologically unselected sample of 12–17-year-old inpatients in need of acute psychiatric hospitalization in a closed ward consisted of 508 adolescents admitted to Unit 70 in Oulu University Hospital during a defined 5-year period. These subjects were interviewed during their hospitalization using the diagnostic semi-structured Schedule for Affective Disorder and Schizophrenia for School-Age Children Present and Lifetime (K-SADS-PL), to identify their psychiatric disorders in terms of DSM-IV and to obtain data on bullying behaviour, substance use, suicidality and somatic diseases. Data on possible criminal offences were extracted from the criminal records of the Finnish Legal Register Centre.

Being a bully and a bully-victim (i.e. a person who bullies others and is also bullied) increased the likelihood of externalizing disorders in general, and more specifically of conduct disorders, by over 14-fold in the boys and over 10-fold in the girls. Among the boys being a victim of bullying elevated the risk of internalizing disorders in general, and more specifically of anxiety disorders, by over 3-fold. Also, being a victim of bullying was statistically significantly associated with chronic somatic diseases (e.g. allergy, asthma and epilepsy), but only among the boys, the odds ratio (OR) being over 2-fold. Furthermore, being a bully increased the likelihood of substance-related disorders by over 2-fold in the boys and over 5-fold in the girls. In addition, examination of the use of substances of various types showed that being a bully increased the risk of regular daily smoking and alcohol use in both sexes and also led to more severe substance use such as cannabis and hard drugs among girls. Being a victim of bullying and bullying others both increased the risk of serious suicide attempts in the girls by over 2 and 3-fold respectively. Furthermore, bullying behaviour was also associated with violent crimes, but not with non-violent crimes, but psychiatric disorders were significant mediating factors in this association of bullying behaviour with criminality, however.

The findings imply that involvement in bullying behaviour is more likely to be a risk factor for inward-directed harmful behaviour than outward-directed aggression, and also suggest that victimized boys are in general more vulnerable than victimized girls, whereas bullying girls have more problems than bullying boys.

Keywords: adolescent psychiatry, bullying, crime, mental disorders, overweight, self-mutilation, somatic diseases, substance abuse, suicide attempt

Luukkonen, Anu-Helmi, Kiusaamiskäyttäytymisen yhteys mielenterveyshäiriöihin, itsetuhoisuuteen ja rikollisuuteen psykiatrisessa osastohoidossa olleiden alaikäisten nuorten keskuudessa

Lääketieteellinen tiedekunta, Kliinisen lääketieteen laitos, Psykiatria, Oulun yliopisto, PL 5000, 90014 Oulun yliopisto; Psykiatrian klinikka, Oulun yliopistollinen sairaala, PL 26, 90029 OYS

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Tiivistelmä

Kiusaaminen on hyvin yleinen ilmiö nuorten keskuudessa, mutta siihen mahdollisesti liittyviä vakavia ongelmia on tutkittu vähän. Tässä tutkimuksessa analysoitiin kiusaamiskäyttäytymisen yhteyttä mielenterveyshäiriöihin, itsetuhoisuuteen ja rikollisuuteen psykiatrisessa osastohoidossa olleiden alaikäisten nuorten keskuudessa. Kiusaamiskäyttäytymistermi kattaa sekä kiusaajien, kiusattujen että kiusaaja-kiusattujen toiminnan.

Tutkimusaineistoon kuului 508 12–17 -vuotiasta nuorta, jotka olivat hoidossa suljetulla psykiatrisella akuuttihoito-osastolla Oulun yliopistollisessa sairaalassa 1.4.2001 ja 31.3.2006 välisenä aikana. Osastohoidon aikana nuoret tutkittiin käyttäen puolistrukturoitua K-SADS-PL -haastattelua, jonka avulla määritettiin nuorten mielenterveyshäiriöt DSM-IV -diagnoosiluokituksen mukaisesti ja saatiin tiedot nuorten kiusaamiskäyttäytymisestä, päihteiden käytöstä, itsetuhoisuudesta ja somaattisista sairauksista. Oikeusrekisterikeskuksen rikosrekisteristä saatiin tutkittavien rikosrekisteritiedot.

Tämä tutkimus osoitti, että nuorilla, jotka ovat kiusaajia tai kiusaaja-kiusattuja, on yli kymmenkertainen riski käytöshäiriöihin verrattuna nuoriin, jotka eivät ole osallistuneet kiusaamiskäyttäytymiseen. Kiusatuilla pojilla on yli kolminkertainen riski ahdistuneisuushäiriöihin. Lisäksi kiusatuksi joutuminen on pojilla yhteydessä kroonisiin somaattisiin sairauksiin kuten allergiaan, astmaan ja epilepsiaan. Tytöillä, jotka kiusaavat, on yli viisinkertainen riski päihdehäiriöihin. Pojilla, jotka kiusaavat, vastaava riski on kaksinkertainen. Molemmilla sukupuolilla toisten kiusaaminen on yhteydessä säännölliseen tupakointiin sekä alkoholin käyttöön ja tytöillä myös kannabiksen ja muiden huumeiden käyttöön. Tytöillä, jotka ovat kiusattuja tai kiusaavat, on yli kaksinkertainen riski vakaviin itsemurhayrityksiin. Lisäksi tämä tutkimus osoitti, että kiusaaminen on yhteydessä väkivaltarikollisuuteen, mutta tätä selittävät merkittävästi nuorten mielenterveyshäiriöt.

Tämän tutkimuksen tulokset viittaavat siihen, että nuorilla, jotka altistuvat kiusaamiskäyttäytymiselle, on muita suurempi riski itsensä vahingoittamiseen useilla eri tavoilla. Sen sijaan kiusaamisen ja toisiin kohdistuvan väkivallan yhteys on lievempi. Sukupuolten välisiä eroja tarkasteltaessa havaittiin, että haavoittuvaisimpia ovat kiusaavat tytöt ja kiusatut pojat.

Asiasanat: itsemurhayritykset, kiusaaminen, mielenterveyshäiriöt, nuorisopsykiatria, päihteet, rikollisuus, somaattiset sairaudet, viiltely, ylipaino

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Oulu, August 2010 Anu-Helmi Luukkonen

Abbreviations

ADHD	Attention-deficit hyperactivity disorder
ANOVA	Analysis of variance
ASPD	Antisocial personality disorder
BMI	Body mass index
CI	Confidence interval
DSM-III-R	Diagnostic and Statistical Manual of Mental Disorders, third edition, revised
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, fourth edition
EuropASI	European Addiction Severity Index
HR	Hazard ratio
K-SADS-PL	Kiddie Schedule for Affective Disorder and Schizophrenia for School-Age Children, Present and Lifetime
MDD	Major depressive disorder
mFTQ	Modified Fagerström Tolerance Questionnaire
N	Number of participants
ND	Nicotine dependence
NE	Non-estimable
NS	Non-significant
ODD	Oppositional defiant disorder
OR	Odds ratio
P	Statistical significance
PCP	Phenylcyclohexylpiperidine
RR	Risk ratio
RRR	Relative risk ratio

List of original publications

This thesis is based on the following original papers, which are referred to in the text by the Roman numerals I-IV.

I Luukkonen A-H, Räsänen P, Hakko H, Riala K & STUDY-70 workgroup (2010) Bullying behavior in relation to psychiatric disorders and physical health among adolescents: A clinical cohort of 508 underage inpatient adolescents in Northern Finland. Psych Res 178: 166–170.

II Luukkonen A-H, Riala K, Hakko H, Räsänen P & STUDY-70 workgroup (2010) Bullying behaviour and substance abuse among underage psychiatric inpatient adolescents. Eur Psych. In press.

III Luukkonen A-H, Räsänen P, Hakko H, Riala K & STUDY-70 workgroup (2009) Bullying behavior is related to suicide attempts but not to self-mutilation among psychiatric inpatient adolescents. Psychopathology 42: 131–138.

IV Luukkonen A-H, Riala K, Hakko H & Räsänen P (2010) Bullying behaviour and criminality: A population-based follow-up study of adolescent psychiatric inpatients in Northern Finland. Forensic Sci Int. In press.

Some unpublished data are also presented in this thesis.

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1 Introduction

Peer relations are especially important in adolescence. One of the principal developmental processes in adolescence is the gradual gaining of personal autonomy from one's parents precisely through such peer relationships. Problems with peers, however, such as bullying, are likely to interfere with this important developmental process (Ranta *et al.* 2009). A great number of adolescents come up against bullying behaviour every day (Luopa *et al.* 2008a), and such behaviour has been widely recognised as a societal problem and an issue of widespread concern over the last two decades (Smith *et al.* 1999). Dan Olweus, the Norwegian 'father' of bullying research, began his systematic examination of the nature and prevalence of bullying behaviour in Scandinavia in the 1970s (Smith *et al.* 2004).

Involvement in bullying behaviour, as either a perpetrator or a victim, has been shown to be related to many serious problems, such as substance use and psychiatric symptoms (see Sections 2.2-2.3). Furthermore, bullying behaviour has also been associated with more severe aggression towards oneself (i.e. suicidality) and towards others (i.e. violent offences) (see Sections 2.5-2.6). Even though several lines of evidence suggest that there exists a link between bullying behaviour and psychiatric problems, the majority of studies have investigated this relation using self-reported psychiatric symptoms rather than psychiatric diagnoses. There is nevertheless also a need for investigations into the relation of bullying behaviour to suicidality and criminal offences that take into account the psychiatric disorders of the subjects, which may be significant mediating factors in this association.

The STUDY-70 project was initiated in 2001, when a new ward for acute cases affecting under-age adolescents was founded in Oulu University Hospital in Finland. The ward was in fact founded on account of an amendment to the Mental Health Act that stipulated that under-age adolescents were no longer to be hospitalized in psychiatric wards together with adults (Aho & Huuhtanen 1992). The present work is a part of this clinical follow-up project, the aim of which was to examine the association of various psychosocial risk factors with severe psychiatric disorders observed among hospital-treated under-age adolescents. This large database consisting of the 508 patients (300 girls, 208 boys) admitted to Unit 70 during the 5-year period concerned made it possible to investigate the putative association between bullying behaviour and psychiatric disorders using valid, reliable psychiatric diagnoses obtained by systematic, well-established

semi-structured diagnostic interview methods (Ambrosini 2000, Kaufman *et al*. 1997).

2 Review of the literature

The works referred to in this review of the literature were selected on the basis of an Ovid Medline search covering the period from 1990 to spring 2010 unless otherwise specified. In addition, the lists of references in the papers concerned were also checked through. In general only studies on adolescents are included in this review of the literature.

2.1 Bullying behaviour

2.1.1 Definition

There is no universally agreed definition of bullying, with the result that definitions vary greatly in the literature. The most commonly quoted is that put forward by Olweus (1999), that bullying behaviour is aggressive behaviour or the doing of intentional harm that is repetitive over time and involves an imbalance of power: The asymmetric power relationship between the bully and the victim is an essential feature; the bullied person must be the weaker party (Olweus 1999). A lack of precision in the terminology for bullying behaviour is also seen in the fact that there is no consensus as to where bullying occurs and who it involves. It can happen anywhere in schools, at home or in the neighbourhood, for example, and theoretically it can also be used to refer to similar behaviour between adults or by adults towards children or adolescents (see for example Eisenberg *et al.* 2003). The most common use of the term bullying, however, refers to peer behaviour among children or adolescents. The distinction between bullying and fighting, for example, is not always an easy one to make, but it is important to remember that the definition of Olweus (1999) requires an imbalance of power between the bully and the victim to distinguish bullying from wider instances of aggression or violence.

Bullying behaviour can be categorized into types. It can be direct (often used synonymously with overt) or indirect (often used synonymously with relational). Direct bullying can be categorized more specifically into physical (e.g. hitting and kicking) and verbal (e.g. name calling and threats), while indirect bullying can be taken to include relational bullying such as social exclusion or the spreading of rumours (see for example Baldry & Farrington 1999). Sexual and racial

harassment are also sometimes viewed as types of bullying behaviour (see for example Klomek *et al.* 2008a, Smith *et al.* 2004).

No well-acknowledged, standard questionnaire exists for assessing bullying behaviour. Informants of various kinds have been used to gather information about bullying behaviour. The most commonly used method is self-reporting, but some researchers have also used questionnaires administered to teachers (see for example Wienke Totura *et al.* 2009) or parents (see for example Emond *et al.* 2007, Nordhagen *et al.* 2005, Schreier *et al.* 2009, Sourander *et al.* 2007b) and also peer nomination procedures (see for example Bacchini *et al.* 2008, Kim *et al.* 2009, Viding *et al.* 2009).

Three categories of persons who become involved in bullying behaviour can be identified: bullies, victims and bully-victims (i.e. those who are both bullies and victims of bullying). In this review of the literature the term bullying behaviour will be taken to refer to all three of these roles and the term victim to a person who is only bullied, unless otherwise specified. Although a lot of valuable information about bullying behaviour is also to be found beyond the field of medicine, mostly in education and the humanities, in this review of literature the focus is on the field of psychiatry.

2.1.2 Prevalence

The prevalence of bullying behaviour varies widely depending on the definition of bullying, the age range and sex of the subjects examined and the country or culture where the investigation was carried out. In a cross-national self-report survey covering over 200 000 school pupils aged 11, 13, and 15 years in 39 European and North-American countries and in Israel, involvement in bullying behaviour varied from 9% (in Sweden) to 45% (in Lithuania), with an overall median of 23%. Of all the pupils involved, 11% reported bullying others, 13% reported being bullied and 4% reported being a bully-victim. In general terms, the prevalence of bullying behaviour was highest in Eastern Europe, and especially in the Baltic States, and lowest in Northern Europe, especially the Nordic countries (excluding Greenland). The prevalence in Finland was 13%, the 6th lowest of all countries surveyed. In all of the countries boys were more involved in bullying others than girls, whereas in most countries girls reported more victimization than boys. Boys reported being bully-victims more often than girls. The rates of victimization generally decreased with advancing age in most of the countries (Craig *et al.* 2009).

In Finland a large national school health survey is conducted every year among 8th and 9th-grade comprehensive school students and 1st and 2nd-grade upper secondary school and vocational school students. In a combined population covering 82% of all Finnish pupils at these grades in the years 2006 and 2007 the prevalence of bullying behaviour was follows: 10% of the boys and 6% of the girls reported being victims of bullying at least once a week, whereas 10% of the boys and 3% of the girls admitted to being bullies. Bully-victims accounted for 3% of the boys and 1% of the girls. Comparison of the results for all the years 2000 to 2007 showed that bullying behaviour in the comprehensive schools had not decreased in any province within the country, but had increased slightly in some provinces such as Northern Ostrobothnia, where it had previously been lower than the average for Finland (Luopa *et al.* 2008a).

2.1.3 Persistence

Several studies have shown that bullying behaviour is relatively persistent (Bond *et al.* 2001, Boulton & Underwood 1992, Egan & Perry 1998, Kumpulainen *et al.* 1999, Kumpulainen & Rasanen 2000, Sourander *et al.* 2000). Its prevalence decreases as the subjects become older, but many of the adolescents who are still involved in bullying behaviour at a later age have also been bullies or victims prior to adolescence. According to a large Finnish study (Sourander *et al.* 2000), almost all of the boys who were victims of bullying at the age of 16 had been victimized at the age of 8. Correspondingly, approximately half of the victims among girls at age 16 had also been bullied at the age of 8. The same study also showed that bully status is less persistent than victim status, in that approximately a half of the boys who were bullies at age 16 had also been bullies at age 8, whereas among the girls only one fourth had been bullies at the age of 8. Hence the persistence of bullying behaviour is stronger in boys than in girls. Another study examining the trajectories of bullying and victimization in early to mid-adolescence (Barker *et al.* 2008) showed that victims had a higher probability of engaging in bullying others than bullies had for later victimization. It can thus be concluded that the transition from victim to bully status is more common than the opposite transition, and that bully-victims are more likely to have been 'pure' victims initially than 'pure' bullies.

2.2 Bullying behaviour in relation to psychiatric symptoms

The prevalence of psychiatric disorders approximately doubles in adolescence by comparison with childhood and the prevalence is approximately the same in adolescence as in adulthood. Some 15–25% of adolescents are reported to have some psychiatric disorder, including approximately 5–10% with a major depressive disorder (MDD) and an estimated 4–11% with an anxiety disorder. Approximately the same proportion of adolescents (i.e. 5–10%) have been found to have a conduct disorder or substance-related disorder, whereas approximately 1% have been shown to have a psychotic disorder (Marttunen & Kaltiala-Heino 2007). Increasing attention has been paid to bullying behaviour as a risk factor for psychiatric disorders within the past ten years.

A review article on the psychiatric conditions associated with bullying behaviour (Kumpulainen 2008) states that bullying is a distressing experience and that it predicts both concurrent and future psychiatric symptoms and disorders. Furthermore, it concludes that few single forms of behaviour are predictive of future problems and signal a need for psychiatric evaluation as clearly as bullying behaviour does. This statement is supported by the findings of a Finnish study of 8-year-old boys (Sourander *et al.* 2007b) which showed that the use of information on bully and victim status as a primary means of screening for those at risk identified almost every third of the males who developed psychiatric disorders in early adulthood. Nevertheless, a boy involved in bullying behaviour had an increased risk of psychiatric disorders only if he was also screened as positive on the parent or teacher Rutter's scale in childhood. Screen-positive bullies had 3-fold odds on having a psychiatric disorder 10 to 15 years later, and the corresponding risk for bully-victims was 5-fold. Screen-positive boys without involvement in bullying behaviour were twice as likely to have a psychiatric disorder in early adulthood than those who were screen-negative and were not involved in bullying behaviour. Furthermore, another prospective Finnish study which included both sexes (Kumpulainen & Rasanen 2000) confirmed that all bullying subgroups have an increased risk of psychiatric problems in adolescence and that bully-victims generally have the greatest risk. In addition, bullying others and being bullied increased the risk of later psychiatric deviance more when the bullying behaviour occurred at the age of 12 than at the age of 8, whereas in the case of bully-victims the findings were the opposite: the younger they were at the time of involvement in bullying behaviour, the more troubled they were at a follow-up 3–7 years later.

Many studies of the association between bullying behaviour and mental health have used more implicit methods for measuring psychiatric problems than actual psychiatric symptoms. Sourander *et al.* (2000) showed that both being a victim (odds ratio (OR) 3.5) and being a bully (OR 4.2) were closely associated with referral to the child mental health services, to the extent that approximately one third of all pupils referred were victims of bullying and the same proportion were bullies. More recently, Sourander *et al.* (2009) examined the association between bullying and victimization at the age of 8 and psychiatric hospital and psychopharmacological treatment when the subjects were between 13 and 24 years old. The results showed that being a victim of bullying predicted psychiatric hospital treatment and the prescription of antipsychotic, antidepressant and anxiolytic drugs among the girls but not among the boys, irrespective of the baseline psychopathology score.

A recent examination of the relation of bullying behaviour to psychiatric problems in adolescent students aged 13–20, grouping the psychiatric symptoms into internalizing problems (e.g. withdrawal, anxiety and depressive symptoms) and externalizing problems (e.g. aggressive, delinquent and rule-breaking behaviour), showed that victims reported higher levels of internalizing symptoms, bullies more externalizing problems, and bully-victims both a higher level of externalizing problems and more internalizing symptoms than uninvolved adolescents (Menesini *et al.* 2009). The following four sections of this review of the literature summarize the findings of studies examining the association between bullying behaviour and symptoms of the major psychiatric diagnostic groups (see Sections 2.2.1-2.2.4).

2.2.1 Depressive symptoms

Of all the psychiatric symptoms it is the association of depressive symptoms with bullying behaviour that has been the most intensively studied. In view of the vast literature concerning this relation, a summary of the statistically significant findings set out in original papers published between 2004 and spring 2010 is provided in Table 1. As can be seen, quite different methods have been used to assess depressive symptoms and actual diagnoses have been made use of in only one instance (Sourander *et al.* 2007b). The majority of papers report a positive association between bullying behaviour and depressive symptoms, with ORs ranging from 1.3 to 32.2 (Brunstein Klomek *et al.* 2007, Carlyle & Steinman 2007, Fekkes *et al.* 2004, Fekkes *et al.* 2006, Fleming & Jacobsen 2009, Klomek

et al. 2008b, Lund *et al.* 2009, Saluja *et al.* 2004, Wienke Totura *et al.* 2009). The single recent study which used ICD-10 diagnoses of depression was conducted only among males and failed to find any statistically significant association between bullying behaviour at age 8 and depression in early adulthood after adjusting for parental education level and baseline emotional and behavioural symptoms (Sourander *et al.* 2007b).

The majority of the cross-sectional studies of the association between being bullied and depressive symptoms found this to be statistically significant, with ORs varying from 1.3 to 9.7 (Brunstein Klomek *et al.* 2007, Carlyle & Steinman 2007, Fekkes *et al.* 2004, Fekkes *et al.* 2006, Fleming & Jacobsen 2009, Lund *et al.* 2009, Saluja *et al.* 2004, Wienke Totura *et al.* 2009). Two out of the three prospective studies did not find an elevated risk of depression (Sourander *et al.* 2007b) or of depressive symptoms among the victims of bullying (Klomek *et al.* 2008b). The one follow-up study which found an association showed that the risk (OR) of depressive symptoms to be 4.2-fold among pupils who had been bullied 6 months earlier, whereas the pupils who had had symptoms of depression 6 months earlier had a 3.4-fold risk of being bullied (Fekkes *et al.* 2006). A gender difference in the association of being bullied with depressive symptoms is possible, but the situation is still unclear. Half of the papers which reported separate results for the sexes found that victimized boys had a higher risk of depressive symptoms than victimized girls (Fleming & Jacobsen 2009, Saluja *et al.* 2004), whereas the other half reported the opposite findings (Brunstein Klomek *et al.* 2007, Carlyle & Steinman 2007).

Findings regarding the association between being a bully and depressive symptoms have been contradictory. Two cross-sectional studies failed to find any association (Fekkes *et al.* 2004, Wienke Totura *et al.* 2009), whereas three found that there is a statistically significant association between bullying others and developing depressive symptoms, the ORs ranging from 1.6 to 8.4 (Brunstein Klomek *et al.* 2007, Carlyle & Steinman 2007, Saluja *et al.* 2004). In the 10-year follow-up study of Klomek *et al.* (2008b) being a bully at the age of 8 increased the risk of depressive symptoms at age 18 over 3-fold relative to those who were not involved in bullying behaviour. Two studies which reported separate results for the sexes showed that bullying girls had a higher risk of depressive symptoms than bullying boys (Brunstein Klomek *et al.* 2007, Saluja *et al.* 2004).

It has been shown in three papers that bully-victims have an increased risk of depressive symptoms and that their risk is generally higher than in any other subgroup, the ORs varying from 3.8 to 32.2 (Brunstein Klomek *et al.* 2007,

Fekkes *et al.* 2004, Klomek *et al.* 2008b). It was also found in the large Finnish national school health survey that bully-victims (and pure victims) had more depressive symptoms than uninvolved adolescents, this association being especially strong among boys (Luopa *et al.* 2008a). The only internationally published study which reported separate results for the sexes showed that bully-victim girls had a much higher risk of depressive symptoms (OR 32.2) than bully-victim boys (OR 6.4) (Brunstein Klomek *et al.* 2007).

Table 1. Summary of the findings of internationally published original papers from 2004 to spring 2010 investigating the association of bullying behaviour with depressive symptoms.

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of depression	Statistically significant findings
Fleming & Jacobsen, 2009	2004, Chile, 4 regions, cross-sectional study	8131, (49%/51%), 13–15 years	SR: 'During the past 30 days, how many days were you bullied and how were you bullied most often?'	SR: 5 questions about sadness or hopelessness, loneliness, insomnia, suicidal thoughts and suicidal plans	RR for depression victim male 1.8 female 1.7
Lund *et al.*, 2009	2004, Denmark, metropolitan area of Copenhagen, cross-sectional study	6094, (all males), 1953 birth cohort: 50–51 years old when answering retrospective questionnaire about bullying	SR: 'Were you bullied at school?'	SR: Current depression: Major Depression Inventory (MDI) and depression at age 31–51 years: 'Has a doctor ever told you that you suffer from depression?' (DD)	OR[1] for depression victim 1.3 (DD) victim (>1 year) 2.2 (MDI) 1.8 (DD) victim (high intensity) 2.6 (MDI) 1.7 (DD)
Wienke Totura *et al.*, 2009	2002–2003, USA, South Florida, cross-sectional study	1442, (52%/48%), 6th, 7th and 8th graders	SR and teacher report: The Revised Olweus Bully/Victim Questionnaire	SR and teacher report: Center for Epidemiological Studies Depression Scale	OR for depression victim (SR) 1.6
Klomek *et al.*, 2008b	1989 and 1999, Finland, follow-up study	2949 at age 8 in 1989 and 2348 at age 18 in 1999, (all males)	At age 8: SR, parents' and teachers' questionnaires	At age 8: Children´s Depression Inventory (CDI). At age 18: Beck´s Depression Inventory (BDI)	OR[2] for depression (BDI≥17) frequently bully 3.3 frequently bully-victim 3.8
Brunstein Klomek *et al.*, 2007	2002 and 2004, USA, 6 New York state high schools, cross-sectional study	2342, (58%/42%), 13–19 years	SR: Several questions derived from the WHO study of youth health	SR: Beck Depression Inventory, cut-off point 16/60 points	OR[3] for depression victim[4] male -/6.5 female 3.3/9.7 bully[4] male -/2.1 female 2.4/8.4 bully-victim[4] female -/32.2 male -/6.4

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of depression	Statistically significant findings
Carlyle & Steinman, 2007	2003, USA, Ohio, Franklin County, cross-sectional study	79 492, (49%/ 51%), 6th-12th graders	SR: 13 questions about frequency of bullying and victimization	SR: frequency of feeling depressed	OR for depressive affect victim[5] male 2.4 female 2.8 bully[6] 6th grade 1.8 8th grade 1.6 12th grade 1.6
Fekkes *et al.*, 2006	1999 and 2000, Netherlands, 18 elementary schools, 6-month follow-up study	1118, (50%/50%), 9–11 years	SR: 'How often have other children bullied you in recent months, since the last summer break (in 1999) or since the winter break (in 2000)?'	SR: Short Depression Inventory for Children, 9-item questionnaire, score ≥7/9 was classified as depressed	victim (in 1999) OR[7] for depression (in 2000) 4.2 depression (in 1999) OR[7] for victim (in 2000) 3.4
Fekkes *et al.,* 2004	1999, Netherlands, 32 elementary schools, cross-sectional study	2766, (50%/50%), 9–12 years	SR: 'How often have other children bullied you and how often have you participated in bullying other children at school this year?'	SR: Short Form Depression Questionnaire for Children, 9 items	OR[8] for depression (moderate/strong indication) victim 5.2/7.7 bully-victim 6.0/5.7
Saluja *et al.*, 2004	1996, USA, cross-sectional study	9863 (48%/52%), 11–15 years	SR: frequency per week for bullying others and being bullied during the past 12 months	SR: A question of ever feeling 'sad, blue, down, or depressed' almost every day for 2 or more consecutive weeks during the past 12 months. 10 statements modified from DSM-III-R describing what might have been experienced when feeling depressed.	RR for depressive symptoms victim male 2.4 female 1.7 bully male 2.0 female 2.4

[1]Adj. for social class and parental mental illness, [2]Adj. for depression (CDI) at age 8, [3]Adj. for schools attended and grade, [4]Less than weekly/frequently, [5]OR adjusted for grade and ethnicity, [6]OR adjusted for gender and ethnicity, [7]Adj. for gender, age and having friends, [8]Adj. for sex, SR = Self-report

2.2.2 Anxiety

The original papers from 1990 to spring 2010 which investigated the association between bullying behaviour and anxiety among adolescents are summarized in Table 2. As can be seen, the instruments for defining anxiety were heterogeneous and only one survey included anxiety disorders (Sourander *et al.* 2007b). The majority reported a positive association between being a victim of bullying and anxiety, with victims having a 1.5 to 3.5 risk (OR) of developing symptoms of anxiety relative to uninvolved adolescents (Bond *et al.* 2001, Fekkes *et al.* 2004, Fekkes *et al.* 2006, Kaltiala-Heino *et al.* 2000, Salmon *et al.* 1998, Sourander *et al.* 2007b, Wienke Totura *et al.* 2009). One 2-year cohort study showed that a history of being a victim of bullying predicted anxiety symptoms in the future but anxiety symptoms did not precede victimization (Bond *et al.* 2001), and another follow-up study likewise quoted the risk of feeling anxious (OR) as 3-fold when the pupil had been bullied 6 months earlier, whereas the risk of being bullied when the pupil had felt anxious 6 months earlier was 2-fold (Fekkes *et al.* 2006). The only study in which ICD-10 psychiatric diagnoses were used reported that being bullied at the age of 8 increased the risk of developing an anxiety disorder in early adulthood 2.6-fold in males. No female subjects were included in that database (Sourander *et al.* 2007b). An investigation into the relation of bullying behaviour to self-reported social phobia showed that boys with symptoms of social phobia have an over 3-fold risk of being a victim of bullying and girls with corresponding symptoms a 2.8–4.3-fold risk, the ORs being dependent on the type of bullying (Ranta *et al.* 2009). The only other study which reported separate results for the sexes showed that, after adjusting for social attachment and socio-demographic factors, recurrent victimization at age 13 remained predictive of self-reported symptoms of anxiety (or depression) at age 14 for girls (OR 2.6) but not for boys (Bond *et al.* 2001).

Only one cross-sectional study found a statistically significant association between being a bully and being anxious (OR 3.8), also reporting a significant association between being a bully-victim and being anxious (OR 6.4) (Kaltiala-Heino *et al.* 2000). A Finnish prospective study also showed that those who are bully-victims at age 8 have the highest risk (OR 5.2) of developing an anxiety disorder in early adulthood (Sourander *et al.* 2007b).

Table 2. Summary of the findings of internationally published original papers from 1990 to spring 2010 investigating the association between bullying behaviour and anxiety.

Authors, year of publication	Time of data collection, area, and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of anxiety	Statistically significant findings
Ranta *et al.*, 2009	Finland, all secondary schools in Tampere and Vantaa, cross-sectional study	3156, (51%/49%), 15–16 years	SR: Overt: How frequently have you been bullied during the ongoing school term? Covert: How frequently have other pupils not wanted to be with you (so that you had to be by yourself) during the ongoing school term? At least twice a month.	SR: Social Phobia Inventory, a 17-item questionnaire for measuring a wide range of symptoms of social phobia. Cut-off score 24/68 points	OR[1] for victim (overt victimization) males with social phobia 3.5 females with social phobia 4.3 OR[1] for victim (covert victimization) males with social phobia 3.1 females with social phobia 2.8
Wienke Totura *et al.*, 2009	2002–2003, USA, South Florida, cross-sectional study	1442, (52%/48%), 6th-8th graders	SR and teacher-report: Revised Olweus Bully/Victim Questionnaire	SR: State/Trait Anxiety Inventory for Children	OR for anxiety victim 1.5
Sourander *et al.*, 2007b	1989, 1999, 2002 and 2004, Finland, nationwide, follow-up study	2540 (all males), 8 years at baseline and 18–23 years at follow-up,	SR, parent and teacher reports. Frequently victim, bully or bully-victim at age 8 according to at least one informant.	ICD-10 psychiatric diagnoses based on call-up health examination (in 1999) and information from the military registry (in 2002 and 2004)	OR[2] for anxiety disorder victim 2.6 bully-victim 5.2
Fekkes *et al.*, 2006	1999 and 2000, Netherlands, 18 elementary schools, 6-month follow-up study	1118, (50%/50%), 9–11 years	SR: 'How often have other children bullied you in recent months, since the summer break (in 1999) or since the winter break (in 2000)?'	SR: 'Have you been feeling anxious?' (Often during the last 4 weeks was regarded as a health problem)	victim (in 1999) OR[3] for anxiety (in 2000) 3.0 anxiety (in 1999) OR[3] for victim (in 2000) 2.0
Fekkes *et al.*, 2004	1999, Netherlands, 32 elementary schools, cross-sectional study	2766, (50%/50%), 9–12 years	SR: 'How often have other children bullied you and how often have you participated in bullying other children at school during this year?'	SR: feeling of anxiety (Often was regarded as a health problem)	OR[4] for anxiety victim 3.5

Authors, year of publication	Time of data collection, area, and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of anxiety	Statistically significant findings
Bond *et al.*, 2001	Australia, Victoria, 2-year cohort study	2680, 13–14 years	SR: Questionnaire about victimization at 3 points; twice at age 13, once at age 14	SR: Questionnaire about anxiety or depression at 3 points; twice at age 13, once at age 14	OR[5] for anxiety (or depression) at age of 14 victim (at both times in age of 13) female 2.6
Kaltiala-Heino *et al.*, 2000	1995 and 1997, Finland, cross-sectional study	1995: 8787 (49%/51%), 14–16 years, 1997: 17643 (51%/49%), 14–16 years	SR: 2 questions derived from WHO youth health study	SR: A question focusing on cognitive aspects of being anxious	OR[6] for anxiety (survey 1997) victim[7] 4.2 bully[7] 3.8 bully-victim[7] 6.4 less than weekly in any bullying role 1.4
Salmon *et al.*, 1998	UK, cross-sectional study	904, (51%/49%), 12–17 years	SR: the Olweus bully/victim questionnaire	SR: 2 questionnaires: the short mood and feelings questionnaire and the revised children's manifest anxiety questionnaire (incorporating a lie scale)	OR[8] for anxiety victim 3.2

[1]Adj. for psychopathology covariates (delinquency, aggression and general anxiety) and family covariates (number of adolescents' moves and parental unemployment), [2]Adj. for parental education level and being screen-positive in parent/teacher reports of the child's total symptoms at age 8, [3]Adj. for gender, age and having friends, [4]Adj. for sex, [5]Adj. for social relations and socio-demographic factors, [6]Adj. for age, sex, family structure and parental education, [7]At least weekly, [8]Adj. for sex, school and school year, SR = Self-report.

2.2.3 Psychotic symptoms

A summary of statistically significant findings in original papers examining the association between bullying behaviour and psychotic symptoms among adolescents, measured using a variety of questions that assess psychotic-like experiences, is presented in Table 3. Four out of five papers reported that victims of bullying had a higher risk of psychotic symptoms or psychotic-like experiences than uninvolved adolescents (Campbell & Morrison 2007, Lataster *et al.* 2006, Nishida *et al.* 2008, Schreier *et al.* 2009). The only prospective study (Schreier *et al.* 2009) showed that being a victim of bullying at the age of 8 or 10 almost doubles the risk (OR 1.9) of psychotic symptoms by the age of 12 relative to uninvolved adolescents. It also showed an exposure-response relationship as the risk of psychotic symptoms (OR) was as much as 4.6-fold if the victimization had been chronic or severe. Here a population-based sample of 12-year-old youngsters were asked whether they had experienced any of the following 12 psychotic symptoms during the last 6 months: visual or auditory hallucinations, delusions of being spied on, persecution, thoughts being read, reference, control, grandiose ability, thought broadcasting, insertion or withdrawal or other unspecified delusions. Bullying was defined as severe if the victim had experienced both types of bullying: overt (i.e. direct physical or verbal aggression) and relational (i.e. social exclusion). If the subject had been bullied both at age 8 and at age 10 this was defined as chronic victimization.

The only paper which did not find an association between being a victim of bullying and psychotic symptoms (Kelleher *et al.* 2008) included in its victim group all the adolescents who admitted to having been bullied, regardless of whether they were also bullies. The bully group also included those adolescents who had also been victims of bullying, i.e. bully-victims (80% of the bully group). The risk of psychotic symptoms (OR) in this combined bully and bully-victim group was even higher 9.9-fold relative to uninvolved adolescents. When only 'pure' bullies were examined in another study (Nishida *et al.* 2008), the risk of psychotic-like experiences was slightly increased (OR 1.3) relative to adolescents who had not been involved in bullying. None of the papers reported their results separately for boys and girls.

Table 3. Summary of the findings of internationally published original papers from 1990 to spring 2010 investigating the association between bullying behaviour and psychotic symptoms.

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of psychotic symptoms	Statistically significant findings
Schreier *et al.*, 2009	1999, 2001 and 2003, England, 1991–1992 cohort study	6437, (49%/51%), 12–13 years	SR: Bullying and Friendship Interview Schedule at age 8 (1999) and 10 (2001), parent and teacher reports	Semi-structured interview at age 12 (2003): Psychosis-Like Symptoms Interview	OR for psychotic symptoms victim 1.9 victim (bullying chronic or severe) 4.6
Kelleher *et al.*, 2008	Ireland, 8 primary schools, cross-sectional study	211, 12–15 years	Interviews with children and parents: K–SADS Social Relations Section: 'Have you ever been bullied or accused of being a bully?' Victim or bully as reported by at least one informant.	Interview for children and parents: K–SADS: psychotic symptoms, primarily auditory and visual hallucinatory experiences	OR[1] for psychotic symptoms history of being a bully[2] 9.9
Nishida *et al.*, 2008	2006, Japan, city of Tsu, cross-sectional study	4894, (52%/48%), 12–15 years	SR: Questions about bullying and victimization	SR: Questions about psychotic-like experiences	OR for psychotic-like experiences bully 1.3 victim 1.6
Campbell & Morrison, 2007	England, Greater Manchester area, cross-sectional study	373, (44%/56%), 14–16 years	SR: Bully/victim Questionnaire	SR: several questionnaires about paranoia, hallucination, dissociative experiences and post-traumatic cognitions inventory	Being a victim was statistically significantly associated with hallucinations, dissociation and paranoia
Lataster *et al.*, 2006	Netherlands, Maastricht and surrounding areas, cross-sectional study	1290, (49%/51%) 13–14 years	SR: 'How many times have you been the victim of bullying in the past year?'. At least once a week.	SR: 'Have you ever had messages sent just to you via the television or radio?' and 'Have you ever thought that people are following you or spying on you?' and 'Have you ever heard voices other people cannot hear?' A positive answer to at least one question.	OR[3] for psychotic experiences victim 3.4

[1]Adj. for gender and socio-economic status, [2]Of which 80% were bully-victims, [3]Adj. for age, gender and socio-economic status, SR = Self-report.

2.2.4 ADHD symptoms, conduct problems and ASPD

The findings regarding the association of bullying behaviour with symptoms of attention-deficit hyperactivity disorder (ADHD), conduct problems and later antisocial personality disorder (ASPD) are presented in Table 4. Apart from one study (Gini 2008), being a bully has consistently been shown to be positively associated with conduct problems (Emond *et al.* 2007, Viding *et al.* 2009). Emond *et al.* (2007) showed in their follow-up study that bullying others at a preschool age was significantly predictive of adolescent aggressive conduct disorder. Similarly, a Finnish prospective 15-year follow-up study showed among males that being a bully or a bully-victim at the age of 8 predicted ASPD in early adulthood, indicating that there is a great risk that the antisocial behaviour of bullies (OR 2.9) and bully-victims (OR 3.9) will continue into later life (Sourander *et al.* 2007b). In the only examination of the risk of conduct problems among victims and bully-victims, both groups had a more than 2-fold risk (OR) of conduct problems relative to those who are not involved in bullying behaviour (Gini 2008). None of the studies of the association between bullying behaviour and conduct problems reported separate results for the sexes (Emond *et al.* 2007, Gini 2008, Viding *et al.* 2009).

Investigations of the relation of being a bully to ADHD and hyperactivity have consistently shown a statistically significant association, with ORs ranging from 2.1 to 3.8 (Bacchini *et al.* 2008, Gini 2008, Holmberg & Hjern 2008, Viding *et al.* 2009). Likewise being a victim of bullying has been shown to be positively associated with symptoms of ADHD and hyperactivity, with ORs varying from 2.4 to 10.8 (Bacchini *et al.* 2008, Gini 2008, Gunther *et al.* 2007, Holmberg & Hjern 2008). The only study which examined the risk of hyperactivity (OR) among bully-victims showed this to be more than a 2.5-fold, higher than in any other bullying subgroup (Gini 2008). Two studies which gave separate results for the sexes reported partly contradictory findings, one showing that there is a significant association between male bullies and ADHD symptoms reported by their teachers whereas female victims tend to have teacher-reported symptoms of ADHD (Bacchini *et al.* 2008), while the other, in which ADHD diagnoses made by child neurologists were used to deduce that both male bullies (OR 1.6) and victims (OR 4.8) have a higher risk of ADHD than their female counterparts (Holmberg & Hjern 2008).

Table 4. Summary of the findings of internationally published original papers from 1990 to spring 2010 investigating the association of bullying behaviour with ADHD symptoms, conduct problems and later ASPD.

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of ADHD, conduct problems and ASPD	Statistically significant findings
Viding *et al.*, 2009	England, cross-sectional study	704, (51%/49%), 11–13 years	Peer report: The ´Guess who´ measure of bullying	SR: Inventory of Callous-Unemotional Traits and Strengths and Difficulties Questionnaire	Correlation (b) between conduct problems and direct bullying 0.37 indirect bullying 0.29 Correlation (b) between hyperactivity and direct bullying 0.28 indirect bullying 0.26
Bacchini *et al.*, 2008	2005, Italy, city of Caserta, cross-sectional study	195, (50%/50%), 8–10 years	Peer report: 'Name three classmates who were often bullies and who were frequent victims of bullying'	Mother report: temperament of their children. Teacher report: ADHD symptoms of pupils	Association (b) between ADHD symptoms and male bully 0.40 female victim 0.31
Gini, 2008	2006, Italy, cross-sectional study	565, (47%/53%) 3rd-5th graders	SR: questionnaire based on Bullying Behaviour Scale and Peer Victimization Scale	Teacher report: Goodman's 25 item Strengths and Difficulties Questionnaire, Teacher version	victim OR for conduct problems 2.4 OR for hyperactivity 2.4 bully OR for hyperactivity 2.1 bully-victim OR for conduct problems 2.4 OR for hyperactivity 2.6
Holmberg & Hjern, 2008	2001–2002, Sweden, Stockholm (Sigtuna), cross-sectional study	577, (51%/49%), 4th graders (10 years)	SR: items from WHO study Health Behaviour of School-aged Children	Teacher and parent report: screening for ADHD (Conners´ 10 item scale), Clinical diagnostic assessment of screen positives for ADHD by a child neurologist	OR for ADHD bully 3.8 male 1.6[1] victim often 10.8 sometimes 2.9 male 4.8[1]

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of ADHD, conduct problems and ASPD	Statistically significant findings
Gunther *et al.*, 2007	Netherlands, Maastricht, 2-year follow-up study	749, (46%/54%), 13–16 years	SR: 'How many times have you been the victim of bullying in the past school year?'	SR: Strengths and Difficulties Questionnaire	Association (b) between victim and hyperactivity 0.44
Emond *et al.*, 2007	1st assessment 2001–2002 and 2nd assessment 2003–2004. Netherlands, 2–3-year follow-up study	1943, (49%/51%), 10–15 years	Parent report: 'How was your child as a pre-schooler (at 4–5 years of age)?' Questionnaire (bullying others)	Parent report: Child Behaviour Checklist. SR: Youth Self-Report	Pre-school bullying of others significantly predicted (b) adolescent aggressive conduct disorder 0.10
Sourander *et al.*, 2007b	1989, 1999, 2002 and 2004, Finland, nationwide, follow-up study	2540, 8 years at baseline and 18–23 years at follow-up	SR, parent and teacherreports. Frequently victim, bully or bully-victim at age 8 according to at least one informant.	ICD-10 psychiatric diagnoses based on a call-up health examination (in 1999) and military registry information (in 2002 and 2004)	OR[2] for ASPD bully 2.9 bully-victim 3.9

[1]Reference group females, [2]Adj. for parental educational level and screening positive in parent/teacher reports of emotional and behavioural symptoms using Rutter scales at the age of 8, SR = Self-report

2.3 Bullying behaviour in relation to substance use

Substance use on the part of adolescents has generally decreased in Finland since the beginning of the new millennium (Luopa *et al.* 2008b, Metso *et al.* 2009, Rimpelä *et al.* 2007). According to the European School Survey Project on Alcohol and Other Drugs, which conducts a survey among 15 and 16-year-old pupils every fourth year, drunkenness (drinking at least 6 units of alcohol) was very common among Finnish young people in the 1990s but has subsequently decreased significantly. On the other hand, it was still the case in 2007 that more than one pupil in ten drank alcohol at least once a week to the extent of becoming drunk. Similarly, although tobacco smoking has decreased since the year 2000, every fifth adolescent smoked at least one cigarette a day in 2007. The age at the initiation of both smoking and binge drinking had risen in 2007 as compared with previous years. Meanwhile, the illegal use of drugs increased rapidly in Finland in the 1990s but has decreased since the beginning of the 21st century. Thus 8% of pupils had taken cannabis at least once by 2007 and 3% of adolescents reported using an illegal drug other than cannabis at least once (Metso *et al.* 2009). The following three sections of this review of the literature focus on summarizing the findings of studies examining the putative association of bullying behaviour with substance use.

2.3.1 Alcohol

Findings regarding the association between bullying behaviour and substance use among adolescents are summarized in Table 5. The definition of substance use varied greatly between these studies, with the questions concerning alcohol, for example, geared towards the assessment of rates of rare alcohol consumption (Nansel *et al.* 2001) as well as frequent excessive drinking (Kaltiala-Heino *et al.* 2000).

Most investigations into the association of alcohol consumption with bullying others have shown that bullies have a higher risk of being drinkers than uninvolved adolescents, the ORs ranging from 1.4 to 4.8 (Alikasifoglu *et al.* 2004, Kaltiala-Heino *et al.* 2000, Kuntsche *et al.* 2007, Kuntsche & Gmel 2004, Molcho *et al.* 2004, Nansel *et al.* 2001, Nansel *et al.* 2004, Niemela *et al.* 2006a, Smith *et al.* 2007, Swahn *et al.* 2008, Taiwo & Goldstein 2006). Furthermore, it was demonstrated in one paper (Sourander *et al.* 2007a) that childhood bullies and bully-victims had approximately a 3-fold risk of committing a drunken

driving offence within the next 8 to 12 years than uninvolved adolescents (see Table 7 in Section 2.6). The smaller number of papers examining the association of alcohol with being a victim of bullying have reported that victims do not in general have a greater risk of alcohol problems than those adolescents who are not involved in bullying behaviour at all (Kaltiala-Heino *et al.* 2000, Kuntsche & Gmel 2004, Nansel *et al.* 2001, Nansel *et al.* 2004, Niemela *et al.* 2006a, Smith *et al.* 2007). The only exception was the finding of Swahn *et al.* (2008) that pupils who had begun alcohol drinking before the age of 13 also reported being victims of bullying more often than adolescents who did not drink alcohol (OR 1.9). Although one of the three studies of alcohol use among bully-victims did not report any statistically significant findings (Nansel *et al.* 2001), the bully-victims in the other two reported more frequent alcohol use than non-involved adolescents (Nansel *et al.* 2004) and had an approximately 3-fold risk of excessive drinking, while the corresponding figure for bullies in the same series was almost 5-fold (Kaltiala-Heino *et al.* 2000).

As seen in Table 5, the majority of studies of the association between alcohol use and bullying behaviour do not analyse the results separately by sex. A South African study, however, has shown a relationship between current alcohol use and bullying only among boys (Taiwo & Goldstein 2006), while somewhat controversially, an Israeli study (Molcho *et al.* 2004) has reported that female bullies had a higher risk of being drunk and indulging in binge drinking (OR 3.2) than male ones (OR 2.6).

2.3.2 Tobacco smoking

The majority of the examinations of the relation of tobacco smoking to bullying behaviour have shown that smoking and bullying others are statistically significantly associated (see Table 5). Bullies have approximately a 2-fold risk of smoking as compared with uninvolved adolescents, the ORs varying from 1.3 to 3.0 (Forero *et al.* 1999, Molcho *et al.* 2004, Morris *et al.* 2006, Nansel *et al.* 2001, Smith *et al.* 2007), and those adolescents who were both bullies and victims of bullying similarly had approximately twice the risk of smoking that uninvolved adolescents had, with ORs ranging from 1.6 to 2.5 (Forero *et al.* 1999, Morris *et al.* 2006, Nansel *et al.* 2001). Smoking rates among victims of bullying did not in general differ significantly from those among adolescents not involved in bullying behaviour. The only exception was reported on the island of Tonga, where victims

of bullying had a 1.6-fold risk of smoking relative to uninvolved adolescents (Smith *et al.* 2007).

The two papers examining gender differences in the association of smoking with bullying behaviour showed that the relation between bullying others and smoking was stronger among girls than among boys (Molcho *et al.* 2004, Morris *et al.* 2006). The risk of daily smoking (OR) was 2.2-fold among male bullies and 2.6-fold among female bullies relative to uninvolved adolescents (Molcho *et al.* 2004).

2.3.3 Illegal drugs

Approximately half of the recent papers investigating the association between illegal drugs and bullying behaviour (Table 5) failed to find any statistically significant association (Smith *et al.* 2007, Taiwo & Goldstein 2006). One Finnish study (Kaltiala-Heino *et al.* 2000) showed that even though bullies (OR 8.2) and bully-victims (OR 7.1) have the highest risk of involvement with illegal drugs, victims also have an elevated risk (OR 2.3).

Carlyle & Steinman (2007) are the only authors to date who have reported sex-specific results concerning the association of illegal drugs with bullying behaviour, concluding that female victims have a higher risk (OR 1.9) of substance use (including marijuana) than males (OR 1.6).

Table 5. Summary of the findings of internationally published original papers from 1990 to spring 2010 investigating the association between bullying behaviour and substance use.

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of alcohol use, smoking and drug use	Statistically significant findings
Swahn *et al.*, 2008	2004, USA, 16 schools in a high-risk community, cross-sectional study	4131, (46%/54%), 7th , 9th, 11th and 12th graders (12–16 years)	SR: Questionnaire including questions on peer violence perpetration and victimization	SR: 'How old were you when you had your first drink of alcohol other than a few sips?'	OR[1] for pre-teen (<13 years) alcohol initiation bully 2.2 victim 1.9
Carlyle & Steinman, 2007	2003, USA, Ohio, Franklin County, cross-sectional study	79492, (49%/51%), 6th-12th graders	SR: 13 questions on the frequency of bullying and victimization	SR: questions about the frequency of substance use (alcohol use, smoking and marijuana use)	OR for substance use victim[2] males 1.6 females 1.9 bully[3] 8th grade 9.7 12th grade 6.1
Kuntsche *et al.*, 2007	2003, Switzerland, cross-sectional study	5419, (49%/51%), 13–16 years	SR: A question about frequency of bullying	SR: Questions about alcohol use: frequency, quantity and frequency of drinking five or more drinks in a row in the last 30 days	Alcohol use significantly predicted (b) bullying others 0.30
Smith *et al.*, 2007	2000–2001, three Pacific islands; Pohnpei, Tonga and Vanuatu, cross-sectional study	Pohnpei: 1495, Tonga: 2808, Vanuatu: 4474, 11–17 years	SR: A question about being bullied and bullying others	SR: Prevalence and frequency of substance use (smoking, alcohol use and illegal drugs)	OR for smoking weekly victim (Tonga) 1.6 bully 1.3–2.0 OR for alcohol misuse[4] bully 1.43
Morris *et al.*, 2006	2003, Canada, cross-sectional study	3314, (48%/52%), 10–20 years	SR: Questions about the frequency of being bullied and bullying others	SR: Questions about smoking. Current smoker was defined as having smoked at least 100 cigarettes in lifetime and some in the past month	Current smokers RRR for bully 2.3 Female smokers[5] RRR for bully 3.0 RRR for bully-victim 2.5

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of alcohol use, smoking and drug use	Statistically significant findings
Niemelä *et al.*, 2006a	1989 and 1999, whole Finland, prospective follow-up study	2306, (all males), 8-year-old pupils at baseline, 18 years old at follow-up	SR: 'I bully other children sometimes or almost every day'. 'Other children bully me sometimes or almost every day'	SR: 'How many times have you been drunk during the past 6 months?'	OR for drunkenness (at least once a week) bully 1.6
Taiwo & Goldstein, 2006	2004, South Africa, 7 schools in Moretele district, cross-sectional study	357, (46%/54%), 11–20 years	SR: Modelled after the questionnaire used in the WHO student drug use surveys	SR: Modelled after the questionnaire used in the WHO student drug use surveys	OR for alcohol use in the last month bully male 2.6
Alikasifoglu *et al.*, 2004	2000, Turkey, Istanbul, cross-sectional study	4153, (53%/47%), 15–20 years	SR: Health Behaviour in School-Age Children questionnaire 1997/1998	SR: Health Behaviour in School-Age Children questionnaire 1997/1998	OR for regular alcohol drinking bully 1.8
Kuntche & Gmel, 2004	2002, Switzerland, cross-sectional study	3648, (49%/51%), 8th-9th graders (mean age 15.3 years)	SR: Questions about bullying others and bullying victimization	SR: 'Have you ever had so much alcohol that you were really drunk?'	Solitary RSODs versus solitary non-RSODs OR for bully 1.4 Social RSODs versus social non-RSODs OR for bully 1.5
Molcho *et al.*, 2004	1998, Israel, cross-sectional study	8394, 6th-10th graders	SR: 'How often have you taken part in bullying other students at school this term?' Involvement over 3 times indicated as bullying.	SR: Questions about smoking, alcohol use	bully OR for daily smoking male 2.2 female 2.6 OR for being drunk and binge drinking during the past 30 days male 2.6 female 3.2
Nansel *et al.*, 2004	1997–1998, cross-national study, 25 countries, cross-sectional study	113 200, (mean ages 11.5, 13.5 and 15.5 years)	SR: Being a victim, bully or bully-victim more than twice during the current term	SR: A questionnaire about alcohol use	Bullies and bully-victims reported statistically significantly more frequent alcohol use than non-involved adolescents in all countries

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of alcohol use, smoking and drug use	Statistically significant findings
Nansel *et al.*, 2001	1998, USA, cross-sectional study	15 686, 6th-10th graders	SR: Frequently a victim or bully during the current term	SR: Questions about alcohol consumption and smoking	bully OR for alcohol use 1.4–2.1 OR for smoking 1.7–1.8 bully-victim OR for smoking 1.6–2.1
Kaltiala-Heino *et al.*, 2000	1995 and 1997, Finland, cross-sectional study	1995: 8787 (49%/51%) 1997: 17643 (51%/49%), 14–16 years	SR: Frequency of being bullied and bullying others during the current term	SR: Questions about excessive drinking and use of cannabis, pills, alcohol with pills, inhalants and hard drugs	OR[6] for frequent excessive drinking bully 4.8 bully-victim 3.1 OR[6] for use of other substances bully 8.2 victim 2.3 bully-victim 7.1
Forero *et al.*, 1999	1996, Australia, New South Wales, cross-sectional study	3918, (45%/55%), 11–16 years	SR: 'Have you ever been bullied at school this term?' and 'How often have you taken part in bullying other students at school this term?'	SR: current smoking (smoking once or more per week)	RRR for current smoking bully 1.5 bully-victim 1.8

[1]Adj. for age, gender and ethnicity, [2]Adj. for grade and ethnicity, [3]Adj. for gender and ethnicity, [4]Being really drunk once or more, or daily kava use, [5]Reference group non-smoking females, [6]Adj. for age, sex, family structure and parental education, RSOD = Risky single occasion drinking, SR = Self-report

2.4 Bullying behaviour in relation to somatic health

2.4.1 Chronic somatic diseases

A vast number of studies have addressed the relation of bullying behaviour to psychosomatic problems, but little is known about its putative association with the common chronic somatic diseases among adolescents. A recent meta-analysis showed that the risk of psychosomatic problems such as headache, abdominal pain and sleeping problems was 1.7 (OR) for bullies, 2.0 for victims and 2.2 for bully-victims (Gini & Pozzoli 2009). Furthermore, it has been shown that victims of bullying not only have a higher prevalence of these symptoms (i.e. headache, stomach-ache, nervousness and difficulties in getting to sleep) but they also take more medicine to treat them, even after controlling for the higher prevalence of such symptoms among victims (Due *et al.* 2007).

A few examinations of the relation between bullying behaviour and chronic somatic diseases have shown that persons with epilepsy have an increased risk for being bullied. It was found among 8–16-year–olds, for instance, that the prevalence of being a victim of bullying is twice as high among subjects with epilepsy than among their healthy peers (Hamiwka *et al.* 2009). Elsewhere it was shown that 2–17-year-old children and adolescents with epilepsy had almost a 5-fold risk of being bullied relative to healthy controls (Nordhagen *et al.* 2005). Likewise, an early onset of psychogenic non-epileptic attacks has been shown to increase the probability of the patient reporting being bullied (Duncan & Oto 2008).

Findings concerning the putative association of bullying behaviour with atopic dermatitis and eczema have been contradictory. Two studies have shown that being bullied is associated with these conditions (Haavet *et al.* 2004, Lewis-Jones 2006), whereas two others did not report any increased risk of victimization among such persons (Hon *et al.* 2008, Nordhagen *et al.* 2005). Meanwhile, the only report of separate results for the sexes showed that being bullied at school was associated with eczema among adolescent males (OR 1.3) but not among females (Haavet *et al.* 2004). Correspondingly, it has been shown that subjects with asthma have almost a 2-fold likelihood of being bullied relative to healthy controls, but no such risk was found among subjects with allergy (Nordhagen *et al.* 2005).

2.4.2 Overweight and obesity

It has been shown in numerous occasions that there is an association between obesity or overweight and being a victim of bullying, with ORs varying from 1.5 to 8.0 (Bell *et al.* 2007, Elgar *et al.* 2005, Griffiths *et al.* 2006, Gunstad *et al.* 2006, Janssen *et al.* 2004, Luopa *et al.* 2008a, Neumark-Sztainer *et al.* 2002, Pearce *et al.* 2002). There have also been a few reports of an association between obesity and bullying others, especially among boys, with ORs ranging from 1.2 to 1.7 (Elgar *et al.* 2005, Griffiths *et al.* 2006, Janssen *et al.* 2004). In one case bully-victims were also analysed separately and shown to have a significant risk of obesity (OR 3.7) (Janssen *et al.* 2004).

The majority of the reports have pointed to a great difference between overweight and obesity in their association with bullying behaviour, suggesting that a certain adiposity threshold must be reached before such an association develops. Many studies have reported a graded increase in victimization with increasing body mass index (BMI) categories (Bell *et al.* 2007, Janssen *et al.* 2004, Neumark-Sztainer *et al.* 2002) or have concluded that obesity is associated with bullying behaviour but overweight is not (Elgar *et al.* 2005, Pearce *et al.* 2002).

According to a large Finnish national school health survey, overweight was associated with being a victim of bullying in girls, but not in boys (Luopa *et al.* 2008a). On the other hand, among the internationally published papers reporting separate results for the sexes, a prospective cohort study (Griffiths *et al.* 2006) showed that among both boys and girls being obese at the age of 7.5 increased the risk of becoming an overt (i.e. direct) victim of bullying a year later over 1.5-fold relative to average-weight peers, while being obese also increased the risk for being an overt bully among the boys, by over 1.6-fold, but not among the girls. Weight status was not associated with relational bullying behaviour in that series. Another paper in which only victimization was assessed showed that obese boys reported more overt victimization and obese girls more relational (i.e. indirect) victimization relative to their average-weight peers (Pearce *et al.* 2002), whereas it was found in an investigation into early life risk factors for adult obesity that a history of being bullied predicted adult obesity only in men (Gunstad *et al.* 2006).

In addition to the association of overweight with bullying behaviour, some attention has also been paid to the impact of weight-related teasing as a specific type of bullying behaviour, showing weight-related bullying to be associated with depressive symptoms in both sexes (Eisenberg *et al.* 2003, Eisenberg *et al.* 2006,

Young-Hyman *et al.* 2006). Two studies in the USA have shown that weight-related or appearance-related teasing is a significant predictor of depressive symptoms among adolescents even after controlling for actual body weight (Eisenberg *et al.* 2003, Keery *et al.* 2005).

2.5 Bullying behaviour in relation to suicidality

2.5.1 Suicide attempts

Suicide is one of the leading causes of death among young people in many countries (Bridge *et al.* 2006). In Finland 41 deaths of adolescents aged 10–19 years were categorized as suicide in 2008, accounting for 24% of all deaths in this age category (Statistics Finland 2009). In addition to the most widely acknowledged risk factors for suicides, such as previous suicidal behaviour, depression and substance abuse (Bridge *et al.* 2006), bullying behaviour has also been shown to be related to suicidality. According to a recently published review (Kim & Leventhal 2008), victims of bullying have been shown to have an increased risk of suicide attempts in 12 out of 13 studies examining this association in the general population, with ORs ranging from 1.5 to 5.4. Two out of four studies included in the review which examined the relation of being a bully to suicide attempts reported that bullies have a higher risk of such attempts than victims, with ORs ranging from 2.3 to 9.9. None of the studies included in the review investigated the risk of suicide attempts among bully-victims, but those examining the risk of suicidal ideation among bully-victims showed that they have the highest risk of all the bullying subgroups, with ORs ranging from 1.9 to 10.0.

The findings of the most recent original papers investigating the association of bullying behaviour with suicide attempts which were not included in the review article published in 2008 are summarized in Table 6. These findings are in line with the review of Kim & Leventhal (2008), which states that the increased risk of suicide attempts for victims of bullying is the most widely acknowledged among all the bullying subgroups (Hidaka *et al.* 2008, Kim *et al.* 2009, Kiriakidis 2008, Klomek *et al.* 2008a, Klomek *et al.* 2009). These reports also confirm the findings contained in the few studies which also included bullies and bully-victims that bullies likewise have an increased risk of attempted and completed

suicides (Kim *et al.* 2009, Klomek *et al.* 2009) and that bully-victims show the greatest risk of all (Klomek *et al.* 2009).

Significant interactions of the association between bullying behaviour and suicidality with gender have also been reported. The only prospective study showed that bullying among boys no longer predicted suicides when controlled for psychopathology, whereas being a victim predicted suicides among girls even when their baseline conduct and depression symptoms were taken into account (Klomek *et al.* 2009). Other studies included in the review by Kim & Leventhal (2008) confirmed that female victims (Eisenberg *et al.* 2003) and bullies have a higher risk of suicidality than their male counterparts (Kim *et al.* 2005).

Table 6. Summary of the findings of internationally published original papers from 2008 to spring 2010 investigating the association between bullying behaviour and suicide attempts.

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of suicide attempts	Statistically significant findings
Kim *et al*., 2009	2000–2001, Seoul, Korea, a 10-month prospective cohort study	1666, (55%/45%), 7th-8th grade students, 13–14 year old	The Korean Peer Nomination Inventory, conducted at baseline and follow-up	The Korean Youth SR, conducted at follow-up: 'I deliberately try to hurt or kill myself.'	OR[1] for a suicide attempt over 6 months incident victim (only at follow-up) male 4.4 persistent bully (bully at baseline and follow-up) female 2.7
Klomek *et al*., 2009	1989, Finland, a prospective cohort study	5302, (51%/49%), 8 years at baseline, follow-up up to 25 years	SR, a parent and a teacher report at age 8. Victim, bully or bully-victim according to at least one informant. Results are for frequent involvement.	Suicide attempts requiring hospital admission and completed suicides up to 25 years of age according to: Statistics Finland's Cause of Death Register, copies of death certificates, and the Finnish Hospital Discharge Register.	Unadj. OR for suicide victim female 4.0 bully[2] male 4.1 bully-victim[2] male 9.2 OR[3] for suicide victim female 5.2
Hidaka *et al*., 2008	2001, Osaka, Japan, a cross-sectional study	2095, (49%/51%), 15–24 years, sample was obtained using a street-intercept technique	SR: Participants described whether they had ever experienced bullying at school.	SR: Participants described whether they had ever attempted suicide.	OR[4] for suicide attempt victim male 5.3/5.3 female 2.3/2.2
Kiriakidis, 2008	Scotland, UK, a cross-sectional study	152, (all males), 16–21 years	SR: a structured interview: Being bullied in custody.	SR: 'Have you ever attempted suicide in custody?'	OR for suicide attempt victim 9.2

Authors, year of publication	Time of data collection, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of suicide attempts	Statistically significant findings
Klomek *et al*., 2008a	2002–2004, USA, 6 high schools in New York State, a cross-sectional study	2341, (58%/42%), 13–19-year-old pupils	6 WHO questions on victimization: Made fun of because of religion, race, looks or speech. Hit, slapped or punched. Spread rumours or mean lies. Made sexual jokes, comments, or gestures. Used e-mail or Internet to be mean.	The Diagnostic Interview Schedule for Children. Any past suicide attempt.	OR[5] for suicide attempt victim male 1.8–5.6 female 2.0–11.4

[1]Adj. for school, socio-demographic factors and baseline suicidality and psychiatric symptoms, [2]No female bullies or bully-victims had attempted or completed suicide, [3]Adj. for Children's Depression Inventory and parent's Rutter conduct scale at baseline, [4] Adj. for age, sexual orientation, substance use, unwanted sex, diagnosed sexually transmitted infection, received money for sex, and self-esteem, [5]Adj. for schools attended and grade, SR = Self-report

2.5.2 Self-mutilation

The prevalence of self-mutilation varies greatly depending on the definition used and the population studied, but figures between 2% and 14% have been suggested for general adolescent populations (Hirvonen *et al.* 2004, Laukkanen *et al.* 2009), whereas the prevalence among adolescent psychiatric inpatients has been shown to be as high as 40–61% (Hirvonen *et al.* 2004). The definition of self-mutilation is not firmly established and there is no consensus regarding the terminology used. Favazza (1989) defines self-mutilation as a deliberate and conscious act aimed at destroying one's own body tissue without intent to kill oneself, and makes a distinction between pathological self-mutilation and socially accepted forms such as piercing. The Columbian Classification Algorithm of Suicide Assessment also specifies that self-mutilation (e.g. superficial cuts, scratches or burning) is not intended to eliminate life but to relieve distress, for example (Posner *et al.* 2007).

Even though several previous studies have examined the relation of bullying behaviour to suicidality, very few have focused on the putative association between bullying behaviour and self-mutilation. This is surprising, as self-mutilation and actual suicide attempts are quite different in nature (Skegg 2005) and it has been shown previously that self-mutilation is related to a history of numerous traumatic experiences (Cavanaugh 2002, Derouin & Bravender 2004). The effect of traumatic experiences is supported by the findings that being a victim of bullying is associated with self-mutilation (Brunner *et al.* 2007, Matsumoto *et al.* 2004, O'Connor *et al.* 2009, Rissanen *et al.* 2006). It has also been observed that bullies self-mutilate more often than others (Rissanen *et al.* 2006), and that bully-victims have the highest risk of all of self-mutilation (Barker *et al.* 2008). Where boys and girls have been analysed separately, bullying behaviour has been more closely associated with self-mutilation in girls than in boys (Barker *et al.* 2008, O'Connor *et al.* 2009). Girl victims had more than a 3-fold risk of self-mutilation, whereas that among boys was over 2-fold (O'Connor *et al.* 2009).

2.6 Bullying behaviour in relation to criminality and delinquency

Although only approximately every fifth crime is committed by persons under 21 years old (Marttunen & Salmi 2009), Finnish police statistics indicate that the

most active time of life for committing crimes is when the subject is 15–20 years old. In other words, adolescence is criminally the most active period of life. A recently published thesis based on a population covering 10% of all Finnish speaking men born in 1981 (Elonheimo 2010) shows that according to police registers of suspected offences as many as 23% of them had committed a crime (minor traffic offences excluded) during the four-year period when they were 16–20 years old. In addition, crimes accumulated among a small proportion of adolescents, 4% of the subjects studied having committed 72% of the crimes. According to this study independent predictors of youth crime were for example parents' low education, not living with two biological parents, child's conduct problems and hyperactivity, ASPD and substance use disorders in late adolescence. In addition to these acknowledged correlates of youth crime, it was also found that self-reports of bullying others at the age of 8 independently predicted violent offences 8–12 years later (see Table 7) (Elonheimo 2010, Sourander *et al.* 2006).

A later paper by Sourander *et al.* (2007a) based on almost exactly the same population and setting showed that bullying behaviour was associated with occasional offences and recidivist offence, and also with almost every specific category of crime (except for drug offences) (see Table 7). It was also found that bullies and bully-victims were responsible for 33% of all crimes and over 23% of violent crimes, even though these groups accounted only less than 9% of the total sample. However, when the children's baseline psychiatric problems were taken into account no bullying status (victim, bully or bully-victim) predicted any kind of crime any longer. In other words, bullying behaviour predicted later crimes only when this condition was accompanied by high levels of psychiatric symptoms (Sourander *et al.* 2007a).

Even though research findings do not imply that victims of bullying have an elevated risk of committing violent offences (Sourander *et al.* 2006, Sourander *et al.* 2007a), this hypothesis has still attracted a lot of attention in the media in recent years. The theory has been triggered by the recent school shootings, as many of the offenders have been victims of bullying (Kumpulainen 2008, Vossekuil *et al.* 2002).

To the best of the author's knowledge, the papers of Sourander *et al.* (2006, 2007a) are the only ones to have investigated the relation between bullying behaviour and criminality (see Table 7). On the other hand, numerous evaluations have been made of the relation between bullying behaviour and delinquency, e.g. the carrying of weapon, the inflicting of intentional injuries or involvement in

physical fights (Barker *et al.* 2008, Cleary 2000, Greene 2003, Ivarsson *et al.* 2005, Kim *et al.* 2006, Liang *et al.* 2007, Nansel *et al.* 2003, Nansel *et al.* 2004, Rudatsikira *et al.* 2008a, Rudatsikira *et al.* 2008b, Smith-Khuri *et al.* 2004, Srabstein & Piazza 2008, Stein *et al.* 2007). Analyses focused on bullies (Nansel *et al.* 2003) or bully-victims (Barker *et al.* 2008, Ivarsson *et al.* 2005, Kim *et al.* 2006, Liang *et al.* 2007, Nansel *et al.* 2004, Srabstein & Piazza 2008, Stein *et al.* 2007) have all shown that bullies have a significantly higher risk of delinquency than adolescents not involved in bullying behaviour (ORs from 1.3 to 5.9) and that bully-victims generally have the greatest risk of all (ORs from 1.6 to 14.2). Victims of bullying have also shown a higher risk of delinquency than uninvolved adolescents (ORs from 1.2 to 4.5), but in many of these studies the variable for delinquency has been involvement in physical fighting, in which it is not possible to identify the actual role of the adolescent (Cleary 2000, Greene 2003, Liang *et al.* 2007, Nansel *et al.* 2003, Nansel *et al.* 2004, Rudatsikira *et al.* 2008a, Rudatsikira *et al.* 2008b, Smith-Khuri *et al.* 2004, Srabstein & Piazza 2008).

Table 7. Summary of the findings of internationally published original papers from 1990 to spring 2010 investigating the association between bullying behaviour and criminality.

Authors, year of publication	Time of data collection years, area and study design	Sample size, (male/female distribution), age of subjects	Definition of bullying	Definition of criminality	Statistically significant findings
Sourander *et al.*, 2007a	1989 and 1998–2001, the whole of Finland, prospective follow-up study	2551, (all males), 8–year-old pupils at baseline, 16–20 years old at follow-up	SR, teacher and parent reports. Frequently victim, bully or bully-victim according to at least one informant	All suspected offences recorded in the national police register	OR[1] for 1–2/>2 crimes bully 2.4/2.6 bully-victim -/2.8 OR for property/violent offence victim 1.6/- bully 2.2/3.7 bully-victim 3.2/2.8 OR for traffic/drunken driving offence bully 2.6/2.8 bully-victim 2.6/3.2 OR for any crime SP no victim/bully 1.6 SP victim 2.1 SP bully 3.3 SP bully-victim 2.0
Sourander *et al.*, 2006	1989 and 1998–2001, the whole of Finland, prospective follow-up study	2713, (all males), 8–year-old pupils at baseline, 16–20 years old at follow-up	SR. Bully: 'I bully other children sometimes or almost every day' Victim: 'Other children bully me sometimes or almost every day'	All suspected offences recorded in the national police register	OR[2] for violent crimes bully 1.6

[1]Adj. for parents' education level, [2]Adj. for family type, parents' education level and Rutter's emotional, conduct and hyperactivity subscores at age 8, SP = Screen-positive for psychiatric symptoms measured on the teachers' and parents' Rutter subscales, SR = Self-report

2.7 Summary of the literature reviewed: what is known and what should be studied?

Previous findings indicate that bullying behaviour is related to many psychiatric conditions such as depressive and psychotic symptoms, anxiety, substance use and conduct problems. The antisocial behaviour of bullies and bully-victims has also been reported to continue later in life. In addition, all the bullying subgroups, victims, bullies and especially bully-victims, have also been shown to have an elevated risk of suicide attempts relative to adolescents who are not involved in bullying behaviour. Even though many interesting findings have already been put forward, there are still many important aspects of this area of research that warrant further study. These will be discussed in more detail below based on the author's knowledge of the existing literature.

Many important studies have been conducted only among males, and thus our current knowledge of problems related to female bullying behaviour is far less clear. Furthermore, the possible gender differences in the association of bullying behaviour with psychiatric disorders and substance use is still a very sparsely studied area. In addition to victims, more attention should also be paid to bullies and bully-victims, as many kinds of problems have also been traced to bullies, and bully-victims have been shown to be the most troubled group in terms of many outcomes.

Very few studies so far have addressed the putative association of bullying behaviour with psychiatric disorders starting out from psychiatric diagnoses instead of self-reported psychiatric symptoms, and majority of these have only included male subjects. Furthermore, no attempt has yet been made to determine subjects' diagnoses by means of systematic diagnostic interviews employing a well-established semi-structured schedule. Likewise, no studies have been carried out on large patient populations.

There is a need to investigate the association between bullying behaviour and severe substance use, e.g. hard drugs, as only a few studies have examined this relation, and no studies so far have explored the association of bullying behaviour with substance abuse through actual diagnoses of substance-related disorders in adolescents, nor has any account been taken of the possibility that psychiatric disorders in adolescents may act as mediating factors in the putative association between bullying behaviour and substance use. Also, only a very few studies investigating the relation of bullying behaviour to suicide attempts have paid

attention to possibly confounding psychiatric disorders such as depression. In addition, the risk of suicide attempts among bullies and bully-victims is a very sparsely studied area.

Only two attempts have been made to examine the putative association of bullying behaviour with criminality, and no paper has yet been published that investigates this association in the two sexes separately or uses data on sentences handed out officially for criminal offences. Similarly, this relation has not yet been examined in the light of the psychiatric disorders diagnosed in the subjects, even though there is some evidence that psychiatric problems are significant mediating factors in this association.

3 Aims of the present research

The main purpose of this work was to investigate the association between bullying behaviour and psychiatric disorders, substance abuse, suicidality and criminality in a sample of under-age adolescent psychiatric inpatients. The more specific aims were:

1. to examine the association of bullying behaviour with psychiatric disorders and somatic health (I).
2. to investigate the relation of bullying behaviour to substance abuse (II).
3. to examine whether bullying behaviour is associated with suicide attempts and self-mutilation (III).
4. to investigate whether there is an association of bullying behaviour with criminal offences and with age at the onset of a criminal career (IV).

As already mentioned, the Roman numerals I-IV in the text refer to the original publications.

4 Material and methods

4.1 Population and data collection (I-IV)

The present research is a part of the STUDY-70 project, a clinical follow-up project initiated to examine the association of various psychosocial risk factors with severe psychiatric disorders among hospital-treated under-age adolescents. This 5-year project took place from 1 April 2001 to 31 March 2006 at the Department of Psychiatry of Oulu University Hospital in Finland, where the population consisted of patients aged 12–17 years admitted for the first time to Unit 70 at the Department of Psychiatry during that period. Of all the eligible adolescents (n=607) 508 (83.7%) participated to the research (see Figure 1).

Of the adolescents admitted to Unit 70 during the period in question, those aged over 18 years (n=1) and those with an intellectual disability (n=26) or organic brain disorder (n=3) were excluded, as also were those who did not give written informed consent to participate or whose parents or guardian refused to do so (n=77) and those who were hospitalized for such a short time that their interviews could not be completed (n=22) (see Figure 1).

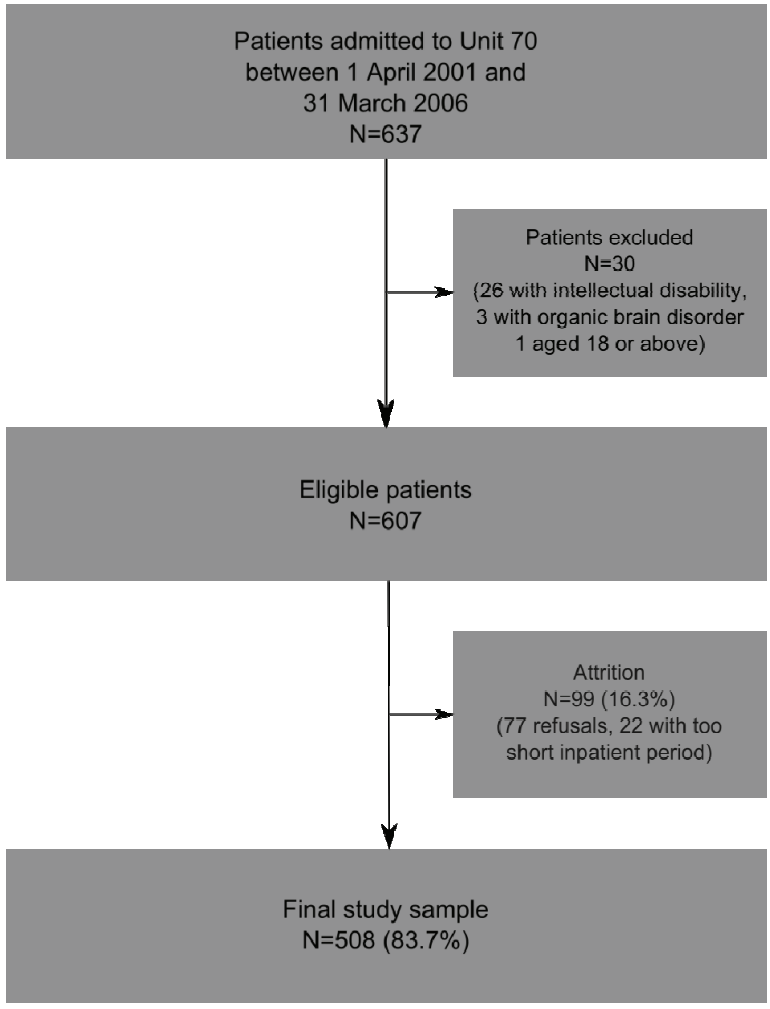

Fig. 1. Flow chart of the sampling procedure in STUDY-70.

Since the catchment area of Unit 70 covers the two northernmost provinces of Finland (the provinces of Oulu and Lapland), accounting for 43% of the country's total area, this series represents epidemiologically an unselected sample of under-age inpatients in need of acute psychiatric hospitalization in a closed ward. In practice the majority of the adolescents (71%) were from the province of Oulu, and 22% were from the city of Oulu. A further 20% of the adolescents were from the province of Lapland and 9% from other provinces in Finland. The great

majority of the adolescents (98%) were Caucasians, approximately 2% being of some other ethnic origin.

4.1.1 Instruments (I-IV)

During hospitalization the subjects were interviewed using the semi-structured Schedule for Affective Disorder and Schizophrenia for School-Age Children, Present and Lifetime (K-SADS-PL), a diagnostic interview routine designed to assess current and past psychopathological episodes in children and adolescents according to the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised* (DSM-III-R) (American Psychiatric Association 1987) *and Fourth Edition* (DSM-IV) criteria (American Psychiatric Association 1994). The test–retest reliability of diagnoses reached using the K-SADS-PL interview has been described as good to excellent, and its concurrent validity and inter-rater agreement have been shown to be high (Ambrosini 2000, Kaufman *et al.* 1997). The present interviews were carried out by the treating physician or by trained medical students under the surveillance of the treating physician. Data were recorded on the basis of both information given by the patient and the physician's evaluation of the diagnostic interview. The interview was supplemented by interviewing the parents in cases where data were missing or remained unreliable after interviewing the patient.

The adolescents were also interviewed during their hospitalization by the nurses of Unit 70 using the European Addiction Severity Index (EuropASI), an objective, face-to-face structured interview which contains questions on following life areas or problems: physical health, employment and financial support, illegal and criminal activity, family and social relationships, psychiatric symptoms, and drug and alcohol use. EuropASI has proved to yield very satisfactory results in terms of reliability and validity when applied to substance-abusing populations (Kokkevi & Hartgers 1995).

4.1.2 Register data (IV)

Data on crimes committed, with dates, were extracted from the criminal records of the Finnish Legal Register Centre on 1st October 2008, during the follow-up phase of the research, when the subjects were 15–24 years old. The criminal records of the Legal Register Centre are a national central register in which data are recorded mostly on persons sentenced to imprisonment. An entry is made

when a person reaching the age of fifteen years has been sentenced to either 1. unconditional or conditional imprisonment, 2. community service, 3. dismissal, 4. a juvenile penalty or a fine in lieu of a juvenile penalty, or 5. a fine (supplementary fine) or period of community service or probation in addition to conditional imprisonment, or else 6. a sentence has been waived on the grounds of a lack of criminal responsibility (Legal Register Centre 2008).

4.2 Variables

4.2.1 General characteristics of the data (I-IV)

The socio-demographic characteristics of the adolescents and family and school background factors are presented in Table 8. The variables were obtained from the K-SADS-PL interviews, except for place of residence and mother's and father's employment status which were taken from the EuropASI data. Similarly the subject's most recent average grade at school was obtained from EuropASI in cases where it was not available from the K-SADS-PL data. The variables are described more in detail in papers I-IV.

Table 8. Socio-demographic characteristics of the subjects and family and school background factors, by bullying status.

Sociodemographic characteristics, family and school factors	Victim	Bully	Bully-victim	No bullying behaviour
	N=176	N=72	N=28	N=232
	(61 boys, 115 girls)	(42 boys, 30 girls)	(14 boys, 14 girls)	(91 boys, 141 girls)
	N (%)	N (%)	N (%)	N (%)
Boys				
Age at admission, mean (sd)	15.3 (1.4)	15.1 (1.5)	15.1 (1.5)	15.6 (1.2)
Place of residence				
City (>100 000 inhabitants)	15 (25)	7 (17)	1 (7)	24 (27)
Town (10 000–100 000 inhabitants)	14 (23)	15 (36)	5 (36)	28 (31)
Small community (<10 000 inhabitants)	32 (53)	20 (48)	8 (57)	38 (42)
Family background				
Family type				
2 biological parents	17 (28)	9 (21)	5 (36)	27 (30)
1 biological parent	24 (39)	12 (29)	1 (7)	34 (37)
Other	20 (33)	21 (50)	8 (57)	30 (33)
Mother employed	33 (54)	24 (57)	3 (21)	58 (64)
Father employed	31 (51)	21 (50)	7 (50)	51 (56)
School factors				
Repeated grade(s)	11 (18)	11 (26)	5 (36)	16 (18)
Special teaching	36 (59)	32 (76)	12 (86)	50 (55)
Teacher's complaint about behaviour	25 (41)	31 (74)	13 (93)	36 (40)
Average grade, mean (sd)	6.9 (0.9)	6.6 (0.8)	6.9 (1.0)	6.9 (0.7)

Sociodemographic characteristics, family and school factors	Victim	Bully	Bully-victim	No bullying behaviour
	N=176	N=72	N=28	N=232
	(61 boys, 115 girls)	(42 boys, 30 girls)	(14 boys, 14 girls)	(91 boys, 141 girls)
	N (%)	N (%)	N (%)	N (%)
Girls				
Age at admission, mean (sd)	15.6 (1.3)	15.8 (1.3)	15.4 (1.4)	15.4 (1.3)
Place of residence				
City (>100 000 inhabitants)	26 (23)	7 (23)	1 (7)	29 (21)
Town (10 000–100 000 inhabitants)	25 (22)	10 (33)	0	36 (26)
Small community (<10 000 inhabitants)	64 (56)	13 (43)	13 (93)	76 (54)
Family background				
Family type				
2 biological parents	61 (53)	4 (13)	2 (14)	65 (46)
1 biological parent	30 (26)	10 (33)	3 (21)	41 (29)
Other	24 (21)	16 (53)	9 (64)	35 (25)
Mother employed	69 (60)	18 (60)	5 (36)	90 (64)
Father employed	74 (64)	22 (73)	7 (50)	95 (67)
School factors				
Repeated grade(s)	5 (4)	6 (20)	6 (43)	9 (6)
Special teaching	45 (39)	21 (70)	9 (64)	52 (37)
Teacher's complaint about behaviour	46 (40)	17 (57)	9 (64)	55 (39)
Average grade, mean (sd)	7.4 (1.0)	6.8 (1.0)	6.7 (1.0)	7.6 (1.0)

Note: N and % indicates positive answers (yes) if not otherwise specified.

4.2.2 Bullying behaviour (I-IV)

The term bullying behaviour is used here to refer to all the three bullying roles: being a victim of bullying, being a bully and being a bully-victim. The data on such behaviour were gathered from two sections of the K-SADS-PL. In the non-structured part (School Adaptation and Social Relations) participants are asked whether they have been bullied or not, while data on bullying others were obtained from the screening for conduct disorder, where the adolescents were asked: "Has there ever been a time when any kids really got on your nerves? Did you sometimes do things to get back at them? Like what? Call them names? Threaten to beat them up? Push them? Trip them? Knock their books out of their hands? Come up from behind and slap them in the face? How often did you do these things?" K-SADS-PL categorizes bullying as follows: 0 = no information, 1 = not present, 2 = sub-threshold (bullied, threatened or intimidated another on only one or two occasions, 3 = threshold (bullied, threatened or intimidated another on three or more occasions). Bullying was defined as present if a subject was categorized as having at least a threshold level of bullying. Based on this information the adolescents were categorized into the following four mutually exclusive subgroups: 1. victims, 2. bullies, 3. bully-victims (i.e., those who were both bullies and victims of bullying) and 4. subjects not involved in bullying behaviour. This categorization is widely used in the literature and is supported by the finding that bully-victims constitute a clearly distinct subgroup from either bullies or victims (Mynard & Joseph 1997). Bullies and bully-victims were combined in the logistic regression analysis in paper I, however, for reasons of statistical power.

4.2.3 Psychiatric disorders (I-IV)

A psychiatric assessment for determining DSM-IV-based psychiatric diagnoses was conducted by means of the K-SADS-PL. As mentioned, the K-SADS-PL has been shown to have high reliability and validity as a diagnostic tool for use with adolescents (Kaufman *et al.* 1997, Shanee *et al.* 1997).

The original psychiatric diagnoses were used in papers I and III, whereas for papers II and IV they were subsequently scrutinized further and carefully validated for the DSM-IV criteria by two experienced psychiatrists. It was at that time that the maximum number of concurrent psychiatric diagnoses for each subject was set at four.

Five major diagnostic categories were used for the current psychiatric disorders of the adolescents in papers II and IV: affective disorders, anxiety disorders, psychotic disorders, substance-related disorders and conduct disorders in paper II, the last-mentioned being replaced with ADHD/oppositional defiant disorder (ODD) in paper IV. In addition to these five major categories, a group of 'other psychiatric diagnoses' in addition to those mentioned in the five major categories was recognised in paper III, the most common diagnoses in this category being adjustment disorders and eating disorders. The DSM-IV diagnoses included in the six major diagnostic categories and the numbers of diagnoses obtained before the validation process can be seen in Table 9. In paper I the diagnoses were further categorized into internalizing and externalizing disorders. An externalizing disorder was said to be present if the adolescent had a substance-related disorder or conduct disorder, whereas an internalizing disorder was said to be present if the adolescent had at least one of the following diagnoses: affective disorder, anxiety disorder or psychotic disorder.

Table 9. DSM-IV codes of the current psychiatric diagnoses of the adolescents and the numbers of diagnoses in the sample before the validation process.

Major diagnostic categories	DSM-IV code	Diagnostic categories	Number of diagnoses	Boys/girls distribution
Affective disorders	296.21	MDD, single episode, mild	13	3/10
(241, 73 in boys/168	296.22	MDD, single episode, moderate	108	28/80
in girls)	296.23	MDD, single episode, severe without psychotic features	28	11/17
	296.24	MDD, single episode, severe with psychotic features	8	2/6
	296.20	MDD, single episode, unspecified	10	4/6
	296.30-.33, .35	MDD, recurrent	13	2/11
	300.4	Dysthymic disorder	5	1/4
	311	Depressive disorder NOS	56	22/34
Anxiety disorders	300.01,.21	Panic disorder	25	5/20
(154, 43 in boys/111	300.02	Generalized anxiety disorder	18	5/13
in girls)	300.22	Agoraphobia	7	3/4
	300.23	Social phobia	39	17/22
	300.29	Specific phobia	13	3/10
	300.30, .31	Obsessive-compulsive disorder	9	2/7
	308.30	Acute stress disorder	1	0/1
	309.81	Post-traumatic stress disorder	39	7/32
	300.00	Anxiety disorder NOS	3	1/2
Psychotic disorders	295.10-.30	Schizophrenia	2	2/0
(54, 27 in boys/27 in	295.40	Schizophreniform disorder	15	11/4
girls)	295.70	Schizoaffective disorder	9	2/7
	297.10	Delusional disorder	3	1/2
	297.30	Shared psychotic disorder	2	0/2
	298.8	Brief psychotic disorder	1	1/0
	298.9	Psychotic disorder NOS	22	10/12
Conduct disorders	312.80-.82	Conduct disorder	163	92/71
(249, 136 in	313.81	ODD	55	21/34
boys/113 in girls)	314.00-.01, .9	ADHD	31	23/8
Substance-related	305.00	Alcohol abuse	114	50/64
disorders	303.90	Alcohol dependence	48	21/27
(293, 159 in	305.20	Cannabis abuse	19	12/7
boys/134 in girls)	304.30	Cannabis dependence	20	15/5
	305.40	Sedative, hypnotic, or anxiolytic abuse	11	7/4

Major diagnostic categories	DSM-IV code	Diagnostic categories	Number of diagnoses	Boys/girls distribution
	304.10	Sedative, hypnotic, or anxiolytic dependence	15	13/2
	305.70	Amphetamine abuse	5	4/1
	304.40	Amphetamine dependence	22	12/10
	305.50	Opioid abuse	5	5/0
	304.00	Opioid dependence	14	6/8
	304.60, .80, .90, 305.10, .30, .90	Other substance abuse or dependence	20	14/6
Psychiatric diagnoses other than those mentioned above (104, 34 in boys/70 in girls)	292.0, .89	Other substance-related diagnoses	4	3/1
	292.11-.12	Substance-induced psychotic disorder	6	1/5
	293.82	Psychotic disorder due to general medical condition	1	1/0
	296.00,.41–44, .50, .61, .63, .80, .89	Bipolar disorder	15	4/11
	296.90, 301.13	Other mood disorder	2	1/1
	299.80	Asperger's disorder/pervasive developmental disorder NOS/Rett's disorder	5	4/1
	300.12, .15	Dissociative disorder	3	0/3
	301.22	Schizotypal personality disorder	1	1/0
	302.90	Paraphilia NOS/sexual disorder NOS	1	1/0
	307.10, 307.50-.51	Eating disorder	22	0/22
	307.23	Tourette's disorder	3	2/1
	307.60	Enuresis	4	2/2
	309.00, .28, .30, .40, .90-.91	Adjustment disorder	21	4/17
	309.21	Separation anxiety disorder	7	4/3
	312.31, .33	Impulsive control disorder	2	2/0
	313.82, .90, 315.90	Other disorder in adolescence	7	4/3

After the validation process the psychiatric disorders were adjusted in the six major diagnostic categories as follows: 23 (4.5%) affective disorder diagnoses were established in the validation and 11 (2.2%) affective disorder diagnoses taken away, the corresponding figures for the other diagnostic categories being 6 (1.2%) and 10 (2.0%) for anxiety disorders, 16 (3.1%) and 0 for psychotic disorders, 11 (2.2%) and 13 (2.6%) for conduct disorders, 3 (0.6%) and 2 (0.4%) for substance-related disorders and 9 (1.8%) and 32 (6.3%) for other psychiatric diagnoses than those mentioned above.

4.2.4 Substance abuse (II)

DSM-IV-based diagnoses for substance-related disorders were obtained from the K-SADS-PL data as described above (Chapter 4.2.3). Information on smoking, alcohol and certain drugs was also obtained from K-SADS-PL. Data on current smoking were obtained from the cigarette/tobacco use screening section, where adolescents were asked about the current quantity of cigarettes they smoked. An adolescent was categorized as a regular smoker if he or she smoked at least one cigarette per day. The subject's age upon smoking regularly for the first time (1 cigarette a day or more) was also ascertained. Correspondingly, the age upon commencement of the regular drinking of alcohol was ascertained in the alcohol abuse screening section. Information on the subject's current drinking of alcohol was obtained from the alcohol abuse supplement section. Adolescents were categorized as drinking alcohol regularly if they did so at least once a week. Before moving on to this supplement section the corresponding screening section had to be positive, i.e. the threshold had to be reached with regard to either quantity, frequency or concern expressed by others about the subject's drinking. Data on drug use were also obtained from the supplement section of the K-SADS-PL, again implying that a certain degree of evidence had to be in existence before moving on to this supplement section. Here the adolescents were asked how often they usually used certain drugs, the specific drugs asked about being cannabis, stimulants, sedatives/hypnotics/anxiolytics, cocaine, opioids, phenylcyclohexyl-piperidine (PCP), hallucinogens, and solvents/inhalants. Adolescents were recorded as using a specific drug if they did so at least once a week.

Each subject's level of nicotine dependence (ND) was assessed using the 7-item modified Fagerström Tolerance Questionnaire (mFTQ) for adolescents (Prokhorov *et al.* 1996), which has shown to be a reliable and valid method for assessing this level in adolescents (Chen *et al.* 2002, Prokhorov *et al.* 2000). The items assess smoking rate, frequency of inhalation, the interval between waking up and the first cigarette, the level of unwillingness to give up the first cigarette in the morning, difficulty in refraining from smoking in places where it is forbidden, smoking despite medical illness, and smoking more during the first 2 hours than during the rest of the day. The sum score on the mFTQ can range from 0 to 9, and the level of ND was categorized according to Prokhorov et al. (1996) into following three groups: 1. no ND (scores from 0 to 2), 2. moderate ND (scores from 3 to 5), and 3. high ND (scores from 6 to 9) (Prokhorov *et al.* 1996).

4.2.5 Psychiatric and substance-related problems among family members (II)

Data on psychiatric problems or substance abuse (alcohol, drugs or other substances) in family members as well were analysed in paper II, the adolescents having been asked in the EuropASI interview whether they had perceived that their mother or father or a sibling had any such problems that ought to be treated by health professionals.

4.2.6 Somatic health (I)

Two variables, chronic somatic diseases and overweight, were used to describe the physical health status of the adolescents. The information on chronic somatic diseases was obtained from the non-structured part of the K-SADS-PL (Child and Adolescent Health Screening). The adolescents were asked if they had any somatic illnesses or conditions for which they received or should be receiving regular care (yes or no, and if yes, then what?).

The data on overweight were based on the weight and height measurements made by a nurse upon the adolescents' admission to psychiatric inpatient, as recorded in the EuropASI questionnaire. The BMI of each subject was calculated based on this information by dividing the weight in kilograms by the square of the height in metres. The subjects were then defined as overweight if their BMI was equal to or greater than the 85th percentile for the BMI in the corresponding sex and age-specific general population, using the BMI growth reference data on Finnish adolescents (Wei *et al.* 2006).

4.2.7 Suicide attempts and self-mutilation (III)

The information on suicide attempts and self-mutilation was obtained from K-SADS-PL screening section for depressive disorders. The information on suicide attempts was based on the following two questions concerning the seriousness of any suicidal intent and the medical lethality of any attempt: "Have you actually tried to kill yourself?" ("none" = no attempt or gesture with any intent to die; "sub-threshold" = present, but very ambivalent; and "threshold" = definite suicidal intent) and "How close were you to dying after your most serious suicidal act?" ("none" = no attempt or gesture with any intent to die; "sub-threshold" = e.g., took 10 aspirins, mild gastritis; and "threshold" = e.g., took 10 Seconal and

suffered a brief period of unconsciousness). The criteria for a suicide attempt were deemed to have been fulfilled if the adolescent had performed at least one suicide attempt that reached threshold level with regard to either of the 2 questions concerning the seriousness of suicidal intent and medical lethality of the attempt.

The information on self-mutilation was obtained from the screening section for depressive disorders, where the adolescents were asked about non-suicidal physical self-damaging acts without any intent to kill themselves ("none" = not present; "sub-threshold" = infrequent (1–3 times a year) but has never caused any serious injury; and "threshold" = frequent (4 or more times a year) or has caused serious injury, e.g. a burn with scarring, a broken bone). An adolescent was defined as having engaged in self-mutilation if a non-suicidal physical self-damaging act had fulfilled the threshold level.

The subjects were placed in the following three subgroups in terms of suicide attempts and self-mutilation in paper III: 1. subjects without suicide attempts or self-mutilation, 2. subjects with self-mutilation but no suicide attempts, and 3. subjects with suicide attempts (including those with both self-mutilation and suicide attempts).

4.2.8 Domestic violence and sexual abuse (III)

Domestic violence and sexual abuse are considered in paper III on the basis of information obtained from the diagnostic screening interview for post-traumatic stress disorder in the K-SADS-PL. The adolescents were asked whether they had witnessed any domestic violence (i.e. explosive arguments at home involving threatened or actual harm to a parent), experienced physical abuse from their parent(s) (i.e. bruises sustained on more than one occasion, or more serious injury sustained) or sexual abuse by any person (i.e. unwanted isolated or repeated incidents of genital fondling, oral sex, or vaginal or anal intercourse).

4.2.9 Criminality (IV)

The data on crimes committed by the subjects after their fifteenth birthday used in paper IV were extracted from the criminal records of the Finnish Legal Register Centre (Legal Register Centre 2008), leading to a division of the population into 3 exclusive categories: violent crimes, only non-violent crimes and no crimes. The following crimes and attempts at these were considered to be violent: homicide,

assault and battery, robbery, arson, violation of domestic peace or crimes involving firearms. All other crimes were defined as non-violent. This categorization is based on the definition used in the Bureau of Justice statistics, which states that a violent crime is a crime in which the offender threatens to use or uses violent force upon the victim. This entails both crimes in which the violent act is the objective, such as murder, and crimes in which violence is the means to an end, such as robbery (Bureau of Justice Statistics 2010).

In addition to the 3 main categories of criminality, certain specific subcategories were analysed separately: recurrent violent crimes, drug offences, drunken driving and crimes involving firearms. The same subjects could be included in more than one of these additional categories. The recurrent violent crimes category implied that the subject had committed at least two violent crimes. Drug offences included various drug-related activities which are illegal in Finland, such as the importing, exporting, distributing, purchasing, manufacture or possession of proscribed drugs. Drunken driving is defined in Finland as driving with a blood alcohol concentration greater than 0.05%. Minor offences such as the illegal possession of firearms were excluded when recording offences involving firearms.

In addition, the information extracted from the criminal records of the Legal Register Centre on the subject's age at the onset of a criminal career (violent or non-violent) was calculated using the day on which the first act of the given type was committed. Similarly, the time between the subject's fifteenth birthday and the date of extraction of the data from the criminal records was also calculated for each subject to represent the potential length of that individual's criminal career.

4.3 Statistical methods

SPSS for Windows (SPSS Inc. 2001), version 13.0, was used in papers II and IV and version 14.0 in papers I and III. All the statistical tests were two-tailed, and statistical significance was set at $p<0.05$. The statistical significances of group differences were analysed with Pearson's Chi-square test or Fisher's exact test for categorial variables and with Student's t-test or the Mann-Whitney U-test for continuous variables. The other tests used in the statistical analyses are presented below.

Paper I. A logistic regression analysis was used to examine the association of bullying behaviour with psychiatric disorders and somatic health after adjustment for age, family type and repeated grades at school.

Paper II. The association between bullying behaviour and substance abuse was investigated with a logistic regression analysis after adjustment for background factors (i.e. age, family type, parents' employment status and psychiatric and substance-related problems among family members) and psychiatric disorders in the adolescents themselves. In the logistic regression analysis bullying behaviour was forced into the model and all the other variables entered stepwise according to given selection criteria.

Paper III. The association of bullying behaviour with suicide attempts and self-mutilation was examined with a logistic regression model after adjustment for age, school factors (i.e. repeated grades, special teaching and teachers' complaints about behaviour), family type, witnessing domestic violence, experiencing physical or sexual abuse and psychiatric disorders.

Paper IV. An analysis of variance (ANOVA) was used to examine group differences (more than two groups) in continuous variables, and logistic regression analysis to examine the association between criminality and bullying behaviour. In addition to the unadjusted logistic regression model, a further model (model I) was adjusted for age, gender, family type, length of potential criminal career and psychiatric diagnoses of the affective, anxiety and psychotic types. Model II was adjusted for age, gender, family type, length of potential criminal career and psychiatric diagnoses of the affective, anxiety, psychotic and substance-related types. Model III was adjusted for age, gender, family type, length of potential criminal career and psychiatric diagnoses of the affective, anxiety, substance-related, psychotic and ADHD/ODD types. Conduct disorders were excluded from the model on account of co-linearity with criminality and bullying. The Cox Proportional Hazard method was used to investigate the association of age on committing the first violent or non-violent crime with bullying behaviour after adjustment for gender, age on admission and time with a criminal record. Adolescents without any criminal record were included in the Cox model as censored cases.

4.4 Ethical considerations

The research plan for the STUDY-70 project, as a whole, including the present research, and for the follow-up phase of the project, including the extraction of the data on criminality from the criminal records of the national Legal Register Centre, was reviewed by the Ethics Committee of the Faculty of Medicine, University of Oulu, on 11th April 2001. Permission to extract the data on

criminality from the criminal records of the national Legal Register Centre and for linking the information to the basic database was obtained from the assistant director of the Legal Register Centre. In addition, the topic for this doctoral thesis was approved by the Postgraduate Research Committee of the Faculty of Medicine, University of Oulu, on 26th August 2008.

The subjects were given a complete description of the research plan and were informed that refusing to participate in the research would not affect their treatment in any way. Signed informed consent was obtained from both the adolescent and at least one parent (or guardian) in each case before enrolment.

4.5 Personal involvement

The author of this thesis has been accorded permission to use the data and has been participating in the STUDY-70 project as a researcher since 2006. She herself extracted the information on bullying behaviour from the K-SADS-PL interviews and constructed the bullying variable used in this work. She was also in charge of the acquiring of data on criminality from the criminal records of the national Legal Register Centre. She has made a major contribution to all the original papers and is named as the first author and the corresponding author in each of them. She also participated in the study design and data analysis and interpreted the results in consultation with her co-authors. She wrote the first draft of each manuscript and was responsible for the final of each paper as submitted.

5 Results

5.1 Prevalence of bullying behaviour

Over 50 percent of all the under-age adolescents admitted to psychiatric inpatient care had been involved in bullying behaviour. The prevalence of bullying behaviour among the boys and girls in the present sample is shown according to bullying status in Figure 2. A statistically significant difference in bullying behaviour was observed between the sexes ($\chi 2$ = 13.1, df = 3, p = 0.004), in that girls predominated among the victims and boys among the bullies.

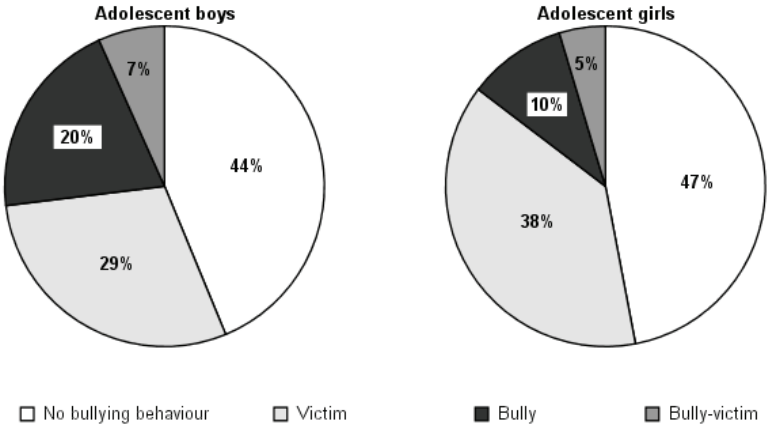

Fig. 2. Prevalence of bullying behaviour among the boys and girls.

5.2 Bullying behaviour and psychiatric disorders (I, II)

The main focus in paper I is on the association of bullying behaviour with psychiatric DSM-IV diagnoses. This association is presented in Figure 3, where the diagnoses received by the adolescents are categorized into internalizing and externalizing disorders. An externalizing disorder was deemed to be present if the adolescent had a substance-related disorder or conduct disorder and an internalizing disorder if the adolescent had an affective disorder, anxiety disorder

or psychotic disorder (at least one of these). As seen in Figure 3, the likelihood of being a bully or a bully-victim as compared with not being involved in bullying behaviour was over 14-fold among the boys who had an externalizing disorder and over 10-fold among the corresponding girls. The likelihood of being a victim was increased over 3-fold among the boys who had an internalizing disorder, but no corresponding association was found among the girls.

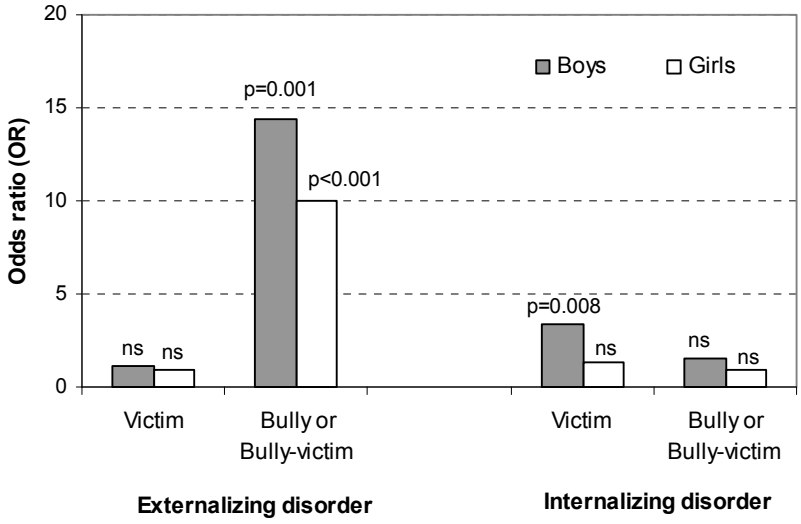

Fig. 3. Association of psychiatric disorders with the likelihood of being a victim of bullying or a bully/bully-victim (modified from I: Figure 1 a).

As seen in Table 10, the associations of the six major diagnostic categories of DSM-IV-based psychiatric disorders with bullying behaviour suggest that the likelihood of being a bully or a bully-victim was over 14-fold among the boys with conduct disorder and over 12-fold among the girls with conduct disorder, while the likelihood of being a victim of bullying was over 3-fold among boys with anxiety disorder but not among the girls. Further analyses were performed for specific anxiety disorders (unpublished data, not reported in Table 10), among which only social phobia was statistically significantly associated with bullying behaviour, and then only among the boys ($\chi 2$ = 8.9, df = 3, p = 0.032). Of the victimized boys 16% had social phobia, whereas the corresponding percentages

for bullies, bully-victims and adolescents not involved in bullying behaviour were 2%, 0% and 7%, respectively.

Table 10. Association of bullying behaviour with the six major diagnostic categories of DSM-IV-based psychiatric disorders in adolescents (unpublished data).

Major diagnostic categories	Victim			Bully/bully-victim		
	adj. OR*	95% CI	p-value	adj. OR*	95% CI	p-value
Boys						
Externalizing disorders						
Substance-related disorder	0.43	0.18–1.06	0.068	1.90	0.71–5.04	0.199
Conduct disorder	1.16	0.46–2.90	0.758	14.5	3.53–59.8	<0.001
Internalizing disorders						
Affective disorder	2.26	0.88–5.80	0.092	1.14	0.43–3.05	0.791
Anxiety disorder	3.19	1.13–9.04	0.029	1.00	0.22–4.47	0.994
Psychotic disorder	3.00	0.86–10.50	0.086	1.15	0.17–7.79	0.889
Other psychiatric disorders	3.36	0.81–13.90	0.095	1.40	0.12–16.12	0.786
Girls						
Externalizing disorders						
Substance-related disorder	0.71	0.37–1.33	0.280	2.70	0.90–8.11	0.077
Conduct disorder	0.93	0.48–1.80	0.821	12.28	3.69–40.88	<0.001
Internalizing disorders						
Affective disorder	0.88	0.47–1.64	0.683	1.28	0.44–3.71	0.646
Anxiety disorder	1.59	0.87–2.92	0.135	0.67	0.21–2.17	0.507
Psychotic disorder	0.84	0.34–2.09	0.712	ne		
Other psychiatric disorders	0.70	0.34–1.45	0.335	0.66	0.15–2.88	0.581

*ORs from a logistic regression model after adjusting for family type, age, repeated grades, chronic somatic diseases and overweight. Ref. category = adolescents not involved in bullying behaviour

5.3 Bullying behaviour and substance abuse (II)

The main aim of paper II was to investigate the association of bullying behaviour with substance abuse. Adolescents with a DSM-IV-based diagnosed substance-related disorder were more likely to be bullies, the ORs being over 2-fold in boys and over 5-fold in girls. In addition, the use of different substances was examined in association with bullying behaviour. For boys, being a bully increased the risk of regular daily smoking over 3-fold, while the corresponding risk among the girls was 14-fold. Conversely, however, the risk for drinking alcohol at least once a week was over 2-fold among the boys who were bullies, but the association was only marginally significant among the girls. In addition, there was also an

association between being a bully and more severe substance use, such as ND, cannabis and hard drugs among the girls, but not among the boys. The risk of high ND among the girls who were bullies was 31.5-fold, that of using cannabis over 8-fold and that of hard drugs over 5-fold (II: Table 5).

5.4 Bullying behaviour and somatic health (I)

An additional focus of paper I was on the association of the adolescents' bullying behaviour with chronic somatic diseases (e.g. allergy, asthma and epilepsy) and with overweight. As seen in Figure 4, chronic somatic diseases were twice as common among victimized boys than among boys who were not involved in bullying behaviour, while no corresponding association was seen among the girls. The association between overweight and being a victim of bullying did not reach statistical significance in either sex.

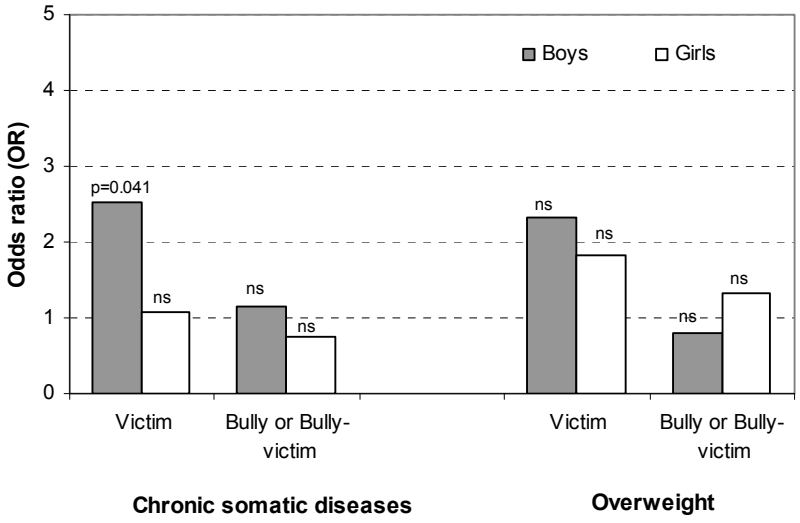

Fig. 4. Association of somatic health with the likelihood of being a victim of bullying or a bully/bully-victim (modified from I: Figure 1 b).

5.5 Bullying behaviour in relation to suicide attempts and self-mutilation (III)

The main focus in paper III was the association of the adolescents' bullying behaviour with suicide attempts and self-mutilation. As seen in Figure 5, the girls who were victims of bullying had approximately a 2-fold likelihood of having made suicide attempts, and the girls who were bullies had more than a 3-fold likelihood of suicide attempts relative to those adolescents not involved in bullying behaviour. No corresponding associations were seen among the boys, nor was any statistically significant association of bullying behaviour with self-mutilation found in either sex.

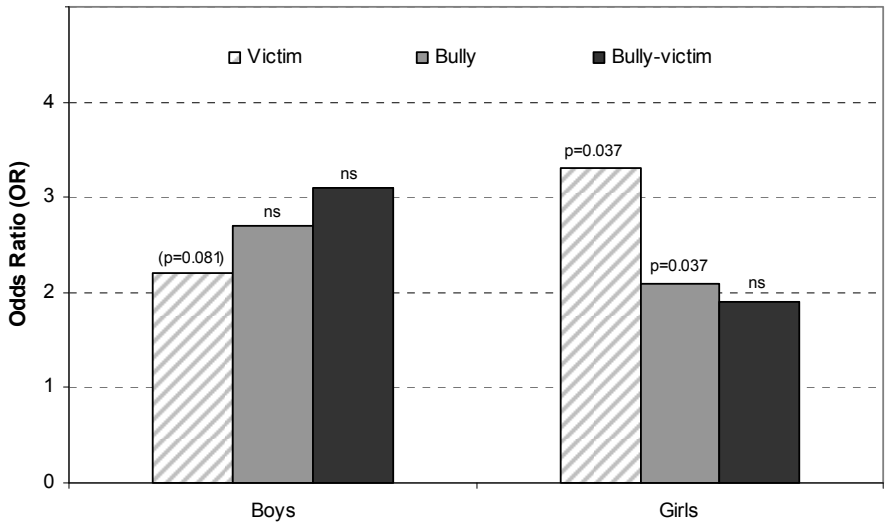

Fig. 5. Association of bullying behaviour with suicide attempts (modified from III: Table 3).

5.6 Bullying behaviour and criminality (IV)

The relation of bullying behaviour to violent and non-violent offences and age at the onset of a criminal career was investigated in paper IV. 29% of the males and 8% of the females in the study population had committed at least one offence, of whom 11% of the males and 4% of the females had committed only non-violent crimes and 18% and 4% violent crimes. Violent crimes were statistically significantly associated with bullying behaviour, but not non-violent crimes (IV: Figure 1a), and, as seen in Figure 6, the bullies were statistically significantly younger than the victims of bullying when starting their violent criminal career. The hazard ratio (HR) for violent crime among the bullies relative to the victims was as high as 3.6-fold. No corresponding difference was observed in the age at the onset of non-violent crimes.

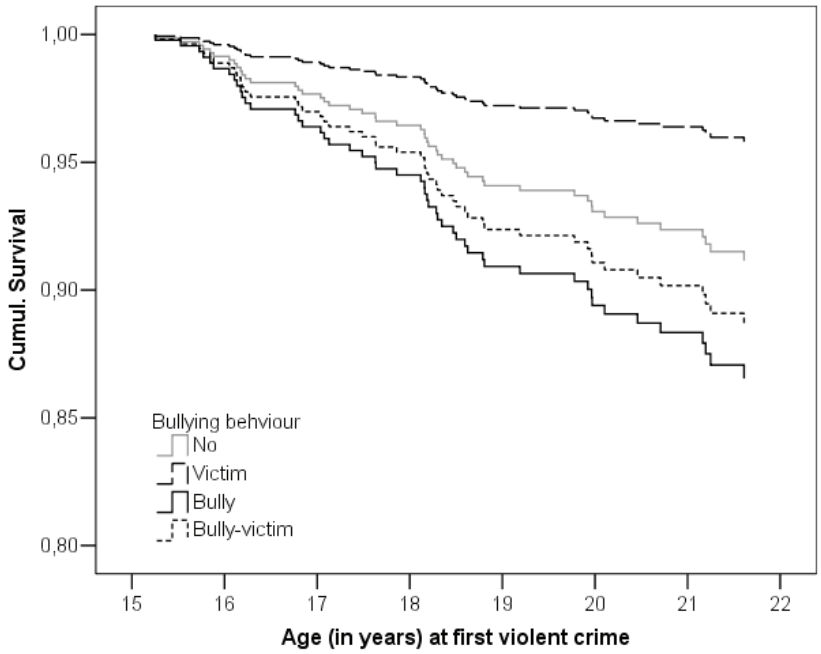

Fig. 6. Ages of victims, bullies, bully-victims and adolescents not involved in bullying behaviour on committing their first violent crime (adjusted for age on admission, sex and the length of the subject's potential criminal career, IV: Figure 2a).

Logistic regression analysis showed that the bullies had an approximately 2-fold likelihood of committing a crime, but after adjusting for age, sex, family type, the length of the subject's potential criminal career and psychiatric disorders (i.e. affective disorders, anxiety disorders and psychotic disorders) the result was non-significant. The risk of committing a crime was lower in the victims of bullying (unadj. OR = 0.45, p = 0.011) than in the adolescents not involved in bullying behaviour, and the result remained marginally significant (OR = 0.51, p = 0.060) after adjusting for the above-mentioned socio-demographic covariates and psychiatric disorders (i.e. affective disorders, anxiety disorders, psychotic disorders, substance-related disorders and ADHD/ODD).

6 Discussion

6.1 Overview of the results

In this sample of under-age psychiatric inpatients the likelihood of being a bully or a bully-victim was higher among those who had an externalizing disorder among both the boys and the girls, whereas the likelihood of being a victim of bullying was increased among the internalizing boys. Of the externalizing disorders, conduct disorder was associated with being a bully in both sexes, and of the internalizing disorders, anxiety disorder was associated with being a victim of bullying in the case of the boys (I).

Being a bully was statistically significantly associated with DSM-IV-based diagnoses of substance-related disorders in both sexes. Being a bully also increased the risk of regular daily smoking in both sexes and the risk of alcohol consumption among the boys. Furthermore, there was an association between being a bully and more severe substance use, such as ND, the use of cannabis and hard drugs among the girls, but not among the boys (II).

The likelihood of being a victim of bullying was increased among the boys with a chronic somatic disease, but not in the girls, while overweight was not associated with bullying behaviour in either the boys or the girls (I).

Both being a victim of bullying and bullying others were significant risk factors for serious suicide attempts in the girls, quite independently of other risk factors. No corresponding association was seen among the boys (III).

Violent crimes, but not non-violent ones, were statistically significantly associated with bullying behaviour, and being a bully was also predictive of an early onset of severe violent offences. Furthermore, the bullies showed an increased likelihood of committing a crime and the victims of bullying a decreased likelihood, but after controlling for psychiatric disorders and other covariates the elevated risk in the case of the bullies became non-significant (IV).

6.2 Discussion of the results

6.2.1 The association of bullying behaviour with psychiatric disorders (I)

As far as is known, this is the first study using DSM-IV psychiatric diagnoses to demonstrate that being bullies or bully-victims increased the likelihood of adolescents, both boys and girls, developing externalizing disorders in general and more specifically conduct disorders, the ORs being over 14-fold in the boys and over 10-fold in the girls. This finding is in line with previous observations that bullies (Emond *et al.* 2007, Viding *et al.* 2009) and bully-victims (Gini 2008) have an increased risk of conduct problems. Even though bullying others is one of the diagnostic criteria for conduct disorder, such a diagnosis is proposed only when the symptoms are clinically significant and when at least three symptoms have been present during the current year and one of them has occurred during the previous six months (American Psychiatric Association 1994). Also, bearing in mind the risk of ASPD in adulthood among adolescents with conduct disorder (Copeland *et al.* 2009), the present results support the finding that bullies and bully-victims have an increased risk of developing ASPD (Sourander *et al.* 2007b). Hence it is reasonable to state that bullying during adolescence is not merely disruptive behaviour limited to that stage in life but may be predictive of more serious psychopathology later in life. As the present database includes girls, and as the sexes are analysed separately, the finding concerning girls in this respect is a novel one.

The over 3-fold increase found here in the likelihood of internalizing disorders in victimized boys is in line with several previous observations of an increased risk of depressive (Brunstein Klomek *et al.* 2007, Carlyle & Steinman 2007, Fekkes *et al.* 2004, Fekkes *et al.* 2006, Fleming & Jacobsen 2009, Lund *et al.* 2009, Saluja *et al.* 2004, Wienke Totura *et al.* 2009) or psychotic symptoms (Campbell & Morrison 2007, Lataster *et al.* 2006, Nishida *et al.* 2008, Schreier *et al.* 2009) or anxiety (Bond *et al.* 2001, Fekkes *et al.* 2004, Fekkes *et al.* 2006, Kaltiala-Heino *et al.* 2000, Salmon *et al.* 1998, Sourander *et al.* 2007b, Wienke Totura *et al.* 2009). There are several possible explanations for this association. Firstly, the traumatization of being bullied may lead to an internalizing disorder (Bond *et al.* 2001, Fekkes *et al.* 2006), secondly, subjects with internalizing disorders may be seen by bullies as easy targets for victimization, as they seem more vulnerable (Crick *et al.* 1999, Fekkes *et al.* 2006) and are less likely to stand

up for themselves, and thirdly, adolescents with internalizing disorders may more readily perceive some of their experiences as instances of victimization, whereas other adolescents would not say that they had been bullied in such a situation (Fekkes *et al.* 2006). This may be the case especially when information about being bullied is collected from reports by the subjects themselves. As Menesini *et al.* (2009) remark in their discussion of this topic, self-report data can provide important information concerning participants' awareness of their own behaviour and their role in a particular phenomenon.

Of all the internalizing disorders, only anxiety disorders were statistically significantly associated with being a victim as far as the boys were concerned, the OR being over 3-fold. This is in line with previous findings in Finland showing that being bullied was associated with social phobia (ORs from 2.8 to 4.3) and with social phobia concurrent with depression (ORs from 3.2 to 11.4), but not with depression alone (Ranta *et al.* 2009). Thus it was that social phobia was the only one of the anxiety disorders that was statistically significantly associated with bullying behaviour among the boys in the present population of adolescents, with its highest prevalence to be seen among the victims. The only previous investigation among adolescents which made use of psychiatric diagnoses did not include female subjects, but it did show that being bullied in childhood increased the risk of anxiety disorders in early adulthood 2.6-fold in males (Sourander *et al.* 2007b). Given that the association of being bullied with anxiety disorders and with internalizing disorders in general was found among the boys in the present series but not among the girls, it is evident the further research is needed to establish whether there is a gender difference in this association.

6.2.2 The association of bullying behaviour with substance abuse (II)

It has been shown here that bullying others is associated with substance use (smoking, alcohol and illegal drugs) and with substance-related disorders, the ORs being over 2-fold in boys and over 5-fold in girls. This is in line with several previous observations that bullying others is related to substance use (Alikasifoglu *et al.* 2004, Carlyle & Steinman 2007, Forero *et al.* 1999, Kaltiala-Heino *et al.* 2000, Kuntsche *et al.* 2007, Kuntsche & Gmel 2004, Molcho *et al.* 2004, Morris *et al.* 2006, Nansel *et al.* 2001, Nansel *et al.* 2004, Niemela *et al.* 2006a, Smith *et al.* 2007, Swahn *et al.* 2008, Taiwo & Goldstein 2006). This is the first time, however, that an association has been demonstrated with DSM-IV-based diagnoses of a substance-related disorder and that account has been taken

of concurrent psychiatric disorders which may be mediating factors in this association. Furthermore, the present findings confirm the theory that bullying others is an independent indicator of a risk of more serious problems.

Being a victim of bullying did not increase the risk of resorting to the use of any particular substance according to the present results, which is contrary to many previous findings (Carlyle & Steinman 2007, Kaltiala-Heino *et al.* 2000, Smith *et al.* 2007, Swahn *et al.* 2008). Earlier investigators had not controlled the analysis for psychiatric diagnoses among the adolescents, however, implying that depression and anxiety disorders might be mediating factors between victimization and substance use. One possible explanation for the low rate of substance use among victims in our series may lie in their difficulties in forming relationships with their peers (Nansel *et al.* 2004) and their lack of friends (Perren & Alsaker 2006), as substance use among adolescents usually occurs in groups. Drunkenness-related alcohol consumption, for example, has been shown to be less common among adolescents who have problems with friendships (Niemela *et al.* 2006b). Furthermore, bullies and bully-victims have been shown to have an increased risk of developing ASPD (Sourander *et al.* 2007b), which commonly occurs concurrently with a substance-related disorder (Ruiz *et al.* 2008).

This is the first time that the association of bullying behaviour with severe substance use has been investigated separately by sex, with the outcome that more severe substance use, such as ND and the use of cannabis and hard drugs, was associated with bullying others among the girls but not the boys. The risk of high ND among the girls who were bullies was over 31-fold, that of cannabis use over 8-fold and that of taking hard drugs over 5-fold. This may be a new example of a gender paradox, in which girls are less likely to be bullies, but when they are, they have a more severe impairment than male bullies (Brunstein Klomek *et al.* 2007, Kim *et al.* 2006, Prinstein *et al.* 2001, Sourander *et al.* 2009).

6.2.3 The association of bullying behaviour with somatic health (I)

The present finding of a 2.5-fold risk of victimization among the boys with chronic somatic diseases, mostly allergy, asthma and epilepsy, is in line with previous results showing that subjects with epilepsy (Hamiwka *et al.* 2009, Nordhagen *et al.* 2005), asthma (Nordhagen *et al.* 2005) and dermatitis have an increased risk of being bullied (Haavet *et al.* 2004, Lewis-Jones 2006). Furthermore, the gender difference found here supports a previous observation that eczema was associated with being bullied at school only in boys (Haavet *et*

al. 2004). This gender difference supports the traditional conception that physical health is considered to be especially important for males (Mangs & Martell 1995). Unfortunately, as the temporal association between bullying and somatic diseases cannot be assessed in the present material, the discussion of whether health problems are the reason for being bullied or whether victimization precedes the health problems, as suggested in the case of psychosomatic symptoms (Fekkes *et al.* 2006, Nishina *et al.* 2005), is bound to remain superficial.

The fact that no statistically significant association was found here between overweight and bullying behaviour may be due to the severely mentally ill status of this sample of adolescent inpatients, as the association has previously been found in general populations (Bell *et al.* 2007, Elgar *et al.* 2005, Griffiths *et al.* 2006, Gunstad *et al.* 2006, Janssen *et al.* 2004, Neumark-Sztainer *et al.* 2002, Pearce *et al.* 2002). Nevertheless, a weak trend towards statistical significance can be seen between overweight and being a victim of bullying, possibly due to the fact, observed on many occasions previously, that a certain threshold of adiposity must be reached before the association can be seen clearly (Bell *et al.* 2007, Elgar *et al.* 2005, Janssen *et al.* 2004, Neumark-Sztainer *et al.* 2002, Pearce *et al.* 2002). The threshold for obesity in many of the previous studies has been 95th percentile (Elgar *et al.* 2005, Neumark-Sztainer *et al.* 2002, Pearce *et al.* 2002) or even higher (Janssen *et al.* 2004), whereas the 85th percentile was used here. Also, the fact that the different types of bullying behaviour were not analysed separately in this case might be of significance, as it has been shown previously that obesity is related to a certain type of bullying behaviour, especially when analysing the findings separately by sex (Griffiths *et al.* 2006, Pearce *et al.* 2002).

6.2.4 The association of bullying behaviour with suicide attempts and self-mutilation (III)

It is shown here that, even after adjustment for psychiatric disorders and other important covariates, being a victim of bullying increases the risk for serious suicide attempts among girls more than 2-fold, whereas being a bully increases the risk over 3-fold. Thus the results provide firm support for previous observations that victims of bullying have an elevated risk of suicide attempts relative to uninvolved adolescents (Hidaka *et al.* 2008, Kim & Leventhal 2008, Kim *et al.* 2009, Kiriakidis 2008, Klomek *et al.* 2008a, Klomek *et al.* 2009), and also provide some support for a few earlier findings that bullies likewise have an

elevated risk (Kim *et al.* 2009, Klomek *et al.* 2009) and that this risk is even higher than among victims (Kim & Leventhal 2008).

The increased risk of suicide attempts by victims of bullying can be understood in the sense that bullying, as a form of abuse, is traumatizing (Paolucci *et al.* 2001). Adolescents are especially vulnerable to this, as peer relations are especially important for the essential developmental processes that take place in adolescence (Ranta *et al.* 2009). It has been shown here that being bullied is an independent risk factor for suicide attempts even after controlling for possible mediating factors such as depression.

It would seem plausible that the elevated risk of suicide attempts among bullies may be due to their tendency for impulsive aggression, i.e. their tendency to react to provocation or frustration with hostility or aggression, which has also been shown to be a significant risk factor for suicidal behaviour (Bridge *et al.* 2006). Bullies have also proved to have a high risk of ASPD (Sourander *et al.* 2007b), which in turn has been found to increase the risk of suicide 8.5-fold along with other cluster B personality disorders (such as borderline, histrionic and narcissistic) even after controlling for mood, substance and conduct disorders (Brent *et al.* 1994).

The present findings are on a par with previous claims that females, both victims (Eisenberg *et al.* 2003, Klomek *et al.* 2009) and bullies, have a higher risk of suicidality than their male counterparts (Kim *et al.* 2005). There are probably several reasons behind this. Firstly, it may be another example of the gender paradox, also seen in the association of bullying behaviour with substance use (see Section 6.2.2), in that girls are less likely to be bullies, but when they are, they have a more severe impairment than their male counterparts (Brunstein Klomek *et al.* 2007, Kim *et al.* 2006, Prinstein *et al.* 2001, Sourander *et al.* 2009). Secondly, it may partly be due to the fact that suicide attempts are more prevalent among girls (Bille-Brahe *et al.* 1997), although completed suicides are more common among boys (Statistics Finland 2006). Thus the boys concerned are not seen in our sample, whereas the attempted suicide cases are most likely to be admitted to Unit 70. Thirdly, as suggested by Klomek *et al.* (2009), it is possible that suicidality among boys who are bullies may be a function of psychopathology, which was controlled for in the present analysis, rather than of bullying behaviour per se. Finally, it was not possible in the present work to take account of developing personality disorders such as borderline personality disorder, as it is normal clinical practice in Finland to diagnose personality disorders only after the age of 18. A developing borderline personality disorder

may nevertheless act as confounding factor in the association between bullying behaviour and suicidality in girls, as it is more common among females than males in clinical samples (Gunderson 2001, Kantojarvi *et al.* 2004) and has been shown to be associated with suicidal behaviour (Oldham 2006, Oquendo *et al.* 2007).

Bullying behaviour was not found here to be associated with self-mutilation in either sex. Although such an association has been reported previously (Barker *et al.* 2008, Brunner *et al.* 2007, Matsumoto *et al.* 2004, O'Connor *et al.* 2009, Rissanen *et al.* 2006), the findings are not directly comparable due to variability in populations and the definitions of self-mutilation. In addition, previous authors have not been able to adjust the results for psychiatric disorders in the adolescents, which may act as mediating factors in the possible association of bullying behaviour with self-mutilation. On the other hand, due to the relatively small number of cases we had to combine the groups of adolescents with suicide attempts and those with both suicide attempts and self-mutilation, which may have obscured a possible association between bullying behaviour and self-mutilation.

6.2.5 The association of bullying behaviour with criminal offences (IV)

As far as is known the present results show for the first time that officially recorded violent offences leading to a court sentence are associated with bullying behaviour in both males and females. Being a bully was predictive of an early onset of severe violent offences, and bullies were shown to have a twice the risk of committing a crime or of committing a violent crime relative to adolescents not involved in bullying behaviour. This supports the theory that criminality is a part of a wider spectrum of antisocial behaviour, which is represented differently in childhood, adolescence and adulthood (Farrington 2003, Farrington 2005). Furthermore, the finding confirms the view that bullying among severely psychopathological adolescents may be a sign of a developing ASPD, which will manifest itself later in life. The association between being a bully and criminality became non-significant, however, after adjustment for age, gender, family type, length of the subject's potential criminal career and psychiatric diagnoses. The latter is in line with observations in the principal previous study on this topic that psychiatric problems in childhood are mediating factors which have a powerful effect on the bullying-criminality association among males (Sourander *et al.*

2007a). This is demonstrated here for the first time in the context of DSM-IV-based diagnoses of psychiatric disorders among boys and girls. These findings clearly emphasize the need for active screening of bullies for psychiatric problems.

It was also discovered here that victims of bullying had approximately half the risk of committing a crime relative to those not involved in bullying behaviour, a result that remained marginally statistically significant even after adjustment for psychiatric diagnoses and other confounding factors. Of the two previous examinations of this relation, one did not find any association (Sourander *et al.* 2006) and the other showed that victims had a 1.6-fold risk of committing a property offence (Sourander *et al.* 2007a). Even in the latter study, however, the risk of criminality among the victims of bullying was not elevated when allowance was made for their psychiatric problems. The protective effect of victimization against criminality may be attributed to the poor peer relations maintained by victims of bullying (Nansel *et al.* 2004, Perren & Alsaker 2006), as group behaviour has shown to be characteristic of juvenile crime (Farrington 2003, Farrington 2005, Felson *et al.* 2008). Furthermore, Moffitt (1993) has argued that delinquency is such a normative peer-group activity among adolescents that those who are not involved in minor antisocial behaviour become stigmatized, causing peers to exclude them from social relationships. It must be borne in mind, however, that the lower risk of criminality found here among victims of bullying does not necessarily apply to the general population, as our reference group also consisted of psychiatric inpatients. Furthermore, as the crime data were extracted when the subjects were 15–24 years old, it is impossible to say whether the protective effect of victimization persists in the later stages of life or whether victims of bullying just start their criminal careers later than other people.

6.3 Methodological considerations

6.3.1 Strengths of the study

The main strength of this work is that, due to the clinical setting, it was possible to use valid, current psychiatric DSM-IV diagnoses arrived at by means of a semi-structured diagnostic interview (K-SADS-PL), which has been shown to be a reliable tool for obtaining DSM-IV-based diagnoses for adolescents (Ambrosini

2000, Kaufman *et al.* 1997, Kim *et al.* 2004). At a later stage in the work the DSM-IV diagnoses were also scrutinized further and carefully validated against the DSM-IV criteria by two experienced psychiatrists.

Data on crimes committed by the adolescents were extracted from the official records of the national Legal Register Centre, which contain information on all crimes known to the police that were committed after the offender's 15th birthday and led to an official court sentence (Legal Register Centre 2008). This detailed information enabled us to analyse violent and non-violent offences separately.

The information on substance use was based on the K-SADS-PL interviews, which provided sufficiently detailed information to allow the various types of substance use to be distinguished. The information on alcohol consumption and the use of specific drugs can be considered reliable since it was obtained by trained professionals using the supplement section of the K-SADS-PL questionnaire. This means that the corresponding screening section of the K-SADS-PL protocol had to be positive before moving on to the supplement section of the interview. The information on ND is reliable since it was assessed using the mFTQ, which has been shown to be a valid and reliable instrument for determining ND among adolescents (Chen *et al.* 2002, Prokhorov *et al.* 2000). The measurements also enabled the severity of ND to be determined.

The information on chronic somatic diseases was based on diagnoses leading to medical treatment, so that no individual subjective symptoms were included (K-SADS-PL). Another strength is that the body weights and heights of the adolescents were measured by a nurse, so that no self-reported values needed to be taken into account. The definition of overweight was based on the BMI cut-off point in the corresponding age and sex-specific Finnish general population (Wei *et al.* 2006).

The population studied here represents an epidemiologically unselected sample of under-age adolescents in need of acute psychiatric hospitalization in a closed ward, because all such adolescents in Northern Finland are initially treated in Unit 70. It thus consisted of the most serious cases in the general adolescent population of the region at the time in question. The final series of inpatients is still a relatively unselected sample of those admitted to Unit 70 for the first time, as 84% of all those eligible actually participated in the study. The data apply to patients admitted consecutively over a 5-year period, which ensures a large database but without any notable changes in adolescent psychiatry practices in Finland.

6.3.2 Limitations of the study

There are a number of limitations that need to be commented on with regard to the present work. Due to the cross-sectional nature of the study the possible causal relationships involved in the associations cannot be properly assessed. It can be assumed, however, that the bullying behaviour, on which lifetime information was sought, had preceded the manifestations of other variables such as psychiatric disorders, substance use and self-mutilation, which were in the nature of current information, and also the criminal offences which the subjects had committed at ages of 15–24 years. It is nevertheless true that the findings can only be extended to adolescents in the general population to a limited degree because the sample consisted entirely of patients admitted to a psychiatric unit. Since no healthy control group was used, it was not possible to compare the findings with regard to these severely mentally ill adolescents with other observations arising from general populations.

Inter-rater agreement was not assessed during the initial data collection phase, even though several researchers and clinicians had been involved in interviewing adolescents according to the K-SADS-PL protocol. The possibility of assessing inter-rater agreement was carefully considered at the planning stage but no measures were taken because of the ethical issues involved. In view of the young age and severe mental illness of the subjects and their relatively short stay in Unit 70, the necessary repeated interviews or videotaping were considered to be too heavy a burden on them. The psychiatric diagnoses of the adolescents were subsequently scrutinized further, however, and were carefully validated against the DSM-IV criteria by two experienced psychiatrists. Further, analyses concerning non-participation were not performed but response rate in the study was high.

The variable for bullying behaviour, which was based on the separate questions in the K-SADS-PL interview, is not necessarily unambiguous and the questions concerning bullying behaviour were used in a parallel approach for generating the four-category bullying variable even though they were not parallel items. Further, the questions in the K-SADS-PL interview concerning bullying behaviour do not allow proper estimation of the type of behaviour or its severity, its frequency, where and when it occurred or whether there was an imbalance of power between the bully and his or her victim. Also the ages at which the adolescents had been involved in bullying behaviour remain unknown, as the only age recorded for the adolescent is that at the time of the interview. This may have

affected the results, as it is thought that those adolescents who are still involved in bullying behaviour at an older age may be more disturbed than those who engage in bullying behaviour when younger, and bullying is more of a norm (Brunstein Klomek *et al.* 2007).

The data on bullying behaviour were based solely on the information given by the adolescents in the interviews, since no teachers' or peer reports were available. One assessment of cross-informant agreement between teachers, parents and those involved in bullying has nevertheless shown that agreement between these informants was poor, and that all three reports of frequent bullying submitted by all three categories of informant predicted later psychiatric disorders, although in the case of frequent victimization only teachers' reports and reports by the victims themselves were predictive of later psychiatric problems (Ronning *et al.* 2009).

The number of adolescents in some subgroups of the population studied, e.g. in the bully-victim group, was rather small, so that some possible findings might have remained statistically non-significant (type II error). Although the main findings are statistically robust, there is some risk of spurious findings (i.e. type I error), since several statistical tests were performed. Furthermore, due to the young age of this patient cohort the follow-up time for criminal activity was short and the number of adolescents who committed crimes was unfortunately too small to allow any analysis of males and females separately.

Finally, even though the criminal records of the Legal Register Centre have undeniable strengths as a source of information, it must be borne in mind that only a minority of all crimes are known to the police and lead to sentences passed by a court. Thus there are a significant number of crimes which are not recorded in the criminal records and there is also an overrepresentation of certain crimes which are more frequently reported to the police (Lappi-Seppälä & Niemi 2009).

7 Conclusions

7.1 Main conclusions to be drawn from the results

The present study shows for the first time that bullying behaviour among both boys and girls is associated with DSM-IV-based psychiatric disorders assessed with valid instruments, and that bullying behaviour is linked with substance use and suicide attempts even when the adolescents' psychiatric disorders are taken into account. Contrary to this latter situation, however, it also points out that psychiatric disorders are powerful mediating factors in the association of bullying behaviour with criminal offences. This is understandable as psychiatric disorders such as disruptive behaviour disorders have been shown to be strong risk factors for criminality (Kjelsberg & Friestad 2009). A further interesting finding is that involvement in bullying behaviour, especially among girls, is more likely to be a risk factor for inward-directed harmful behaviour than for outward-directed aggression.

It also become evident that boys who are victims of bullying are generally more vulnerable than girls who are in this position, whereas girls who are bullies have more problems than the corresponding boys. Victimization in boys is associated with both somatic diseases and internalizing psychiatric disorders. Correspondingly, bullying others is associated with severe substance use and suicide attempts in the case of girls but not boys.

7.2 Implications for further research

It would be essential in the future to assess the causality of the associations found in the present study. Are mentally ill adolescents more prone to being bullied, for example, or is the bullying a partial cause of their illness? It would also be important to study the extent to which the present findings apply to outpatients and the general adolescent population. In addition, prospective studies with long follow-up times will be needed to explore what is the long-term effect of being involved in bullying behaviour. The important ongoing work aimed at assessing and developing group intervention techniques for preventing bullying behaviour among adolescents should be continued (see Smith *et al.* 2004 for example). Furthermore, it would be essential to study the validity of the various questionnaires and other methods which are used to define the bullying status of

adolescents and to assess the type, length and timing of the bullying behaviour. It would then be central for the whole field of bullying research to reach a consensus based on these future studies as to what would be the gold standard for assessing bullying behaviour.

7.3 Clinical implications

The present findings underline the fact that bullying behaviour in general is a significant independent marker of a risk of more serious problems, and one that should be taken into account when screening adolescents. It is also clear from these findings that not only victims of bullying but also bullies and bully-victims have an elevated risk of psychiatric disorders, and also suicide attempts in the case of bullies. In addition, bullying others, especially when combined with psychiatric disorders, should be seen as a marker of a risk of more serious violence (i.e. violent criminal offences), so that it emphasizes the need for the active screening of bullies for psychiatric problems. It would also be crucial to study what psychiatric interventions might be possible for preventing the potential negative outcomes of bullying behaviour.

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