MINNA RITAKALLIO

Self-Reported Depressive Symptoms and Antisocial Behaviour in Middle Adolescence

ACADEMIC DISSERTATION
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LIST OF ORIGINAL PUBLICATIONS

This dissertation is based on the following original publications, which are referred to in the text by the Roman numerals I-IV:


III Ritakallio M, Luukkaala T, Marttunen M, Pelkonen M and Kaltiala-Heino R. Comorbidity between depression and antisocial behaviour in middle adolescence: the role of perceived social support. (Accepted in Nord J Psychiatry)


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### ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AACAP</td>
<td>American Academy of Child and Adolescent Psychiatry</td>
</tr>
<tr>
<td>ADHD</td>
<td>Attention Deficit Hyperactivity Disorder</td>
</tr>
<tr>
<td>AL</td>
<td>Adolescent limited group</td>
</tr>
<tr>
<td>AMHC Study</td>
<td>The Adolescent Mental Health Cohort Study</td>
</tr>
<tr>
<td>APA</td>
<td>American Psychiatric Association</td>
</tr>
<tr>
<td>APD</td>
<td>Antisocial Personality Disorder</td>
</tr>
<tr>
<td>BDI</td>
<td>Beck Depression Inventory</td>
</tr>
<tr>
<td>CAPA</td>
<td>The Child and Adolescent Psychiatric Assessment</td>
</tr>
<tr>
<td>CBCL</td>
<td>Child Behavior Checklist</td>
</tr>
<tr>
<td>CD</td>
<td>Conduct Disorder</td>
</tr>
<tr>
<td>CDI</td>
<td>Children Depression Inventory</td>
</tr>
<tr>
<td>CES-D</td>
<td>Center for Epidemiological Studies-Depression Scale</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>DISC</td>
<td>Diagnostic Interview Schedule for Children</td>
</tr>
<tr>
<td>DOF</td>
<td>Parent Daily Report and Direct Observation Form</td>
</tr>
<tr>
<td>DSM</td>
<td>Diagnostic and Statistical Manual of Mental Disorders</td>
</tr>
<tr>
<td>DSM-III</td>
<td>Diagnostic and Statistical Manual of Mental Disorders, third edition</td>
</tr>
<tr>
<td>DSM-III-R</td>
<td>Diagnostic and Statistical Manual of Mental Disorders, third edition, revised</td>
</tr>
<tr>
<td>DSM-IV</td>
<td>Diagnostic and Statistical Manual of Mental Disorders, fourth edition</td>
</tr>
<tr>
<td>FSRD</td>
<td>The Finnish Self-Reported Delinquency Study</td>
</tr>
<tr>
<td>HRSD</td>
<td>Hamilton Rating Scale for Depression</td>
</tr>
<tr>
<td>ICD-10</td>
<td>International Classification of Diseases, tenth edition</td>
</tr>
<tr>
<td>IQ</td>
<td>Intelligence Quotient</td>
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<tr>
<td>ISRD-I</td>
<td>The International Self-Report Delinquency Study I</td>
</tr>
<tr>
<td>K-SADS</td>
<td>The Schedule for Affective Disorders and Schizophrenia for School-Aged Children</td>
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<tr>
<td>LCP</td>
<td>Life-course persistent group</td>
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<tr>
<td>MDD</td>
<td>Major Depression Disorder</td>
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<tr>
<td>MDE</td>
<td>Major Depressive Episode</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
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<tr>
<td>ODD</td>
<td>Oppositional Defiant Disorder</td>
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<tr>
<td>OR</td>
<td>Odds Ratio</td>
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<tr>
<td>PSSS-R</td>
<td>The Perceived Social Support Scale-Revised</td>
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<tr>
<td>RADS</td>
<td>Reynolds Adolescent Depression Scale</td>
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<tr>
<td>RBDI</td>
<td>The Finnish modification of the 13-item Beck Depression Inventory</td>
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<tr>
<td>SDQ</td>
<td>The Strengths and Difficulties Questionnaire</td>
</tr>
<tr>
<td>SRD</td>
<td>Self-Report Delinquency Scale</td>
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<tr>
<td>SES</td>
<td>Socioeconomic Status</td>
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<tr>
<td>SHPS</td>
<td>The School Health Promotion Study</td>
</tr>
<tr>
<td>STAKES</td>
<td>Sosiaali- ja terveysalan tutkimus- ja kehittämiskeskus (National Research and Development Centre for Welfare and Health)</td>
</tr>
<tr>
<td>TRF</td>
<td>Teacher Report Form</td>
</tr>
<tr>
<td>YSR</td>
<td>Youth Self-Report</td>
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ABSTRACT

The general aim of this study was to analyse associations between self-reported depressive symptoms and antisocial behaviour both concurrently and longitudinally in a community sample during middle adolescence. In more detail, the study aimed to investigate the continuity of self-reported depressive symptoms and antisocial behaviour, associations between self-reported depressive symptoms, antisocial behaviour and perceived social support, the patterns of delinquency in relation to self-reported depressive symptoms and longitudinal associations between self-reported depressive symptoms and antisocial behaviour.

The present study is based on two Finnish community studies among adolescents: the School Health Promotion Study (SHPS) 2002 and the Adolescent Mental Health Cohort Study (AMHC Study). SHPS is a nationwide cross-sectional survey carried out biannually in the same municipalities. The AMHC Study is a prospective cohort study conducted in the Finnish cities of Tampere and Vantaa, and consists of assessments at baseline (9th grade) and at 2-year follow-up. The subjects were 14 to 16-year-old adolescents in SHPS [N 50, 569 (50.1% boys)] and 15 to 17-year-old adolescents in the AMHC Study [N 3, 278 (50.9% boys) at baseline, N 2, 070 (43.6% boys) at follow-up]. The data was collected through school surveys based on self-report scales previously widely used in depression and antisocial behaviour research.

According to the cross-sectional study perceived social support was inversely associated both with self-reported depressive symptoms and antisocial behaviour. The results emphasized specially the role of family support in buffering adolescents against depressive symptoms and antisocial behaviour. Concurrent comorbidity between self-reported depressive symptoms and antisocial behaviour in cross-sectional study design was high in both sexes, as adolescents displaying antisocial behaviour had a up to seven-fold greater risk of being depressed. Although perceived social support modified comorbidity between self-reported depressive symptoms and antisocial behaviour, antisocial behaviour still remained independently associated with depressive symptoms. The risk for self-reported depressive symptoms varied according to various forms of delinquent acts and increased according to the increased frequency of delinquency. Among females the strongest association was found in frequent vandalism and among males in frequent violence. Further, delinquent behaviour of depressed adolescents was more versatile than that of non-depressed adolescents, who had mainly specialized in one type of offence.
According to the follow-up study both self-reported depressive symptoms and antisocial behaviour showed considerable continuity during the 2-year period. There were no significant gender differences either in the continuity of self-reported depressive symptoms or in the continuity of antisocial behaviour. Self-reported depressive symptoms predicted subsequent antisocial behaviour in a 2-year period among females, but among males the history of depressive symptoms protected against subsequent antisocial behaviour. In either sex antisocial behaviour did not longitudinally predict subsequent self-reported depressive symptoms when prior depressive symptoms were controlled for.

In conclusion, the results of the present study suggest that self-reported depressive symptoms and antisocial behaviour have a fairly stable course and remarkable comorbidity in middle adolescence. Self-reported depressive symptoms differentiate patterns of delinquent behaviour. Special attention should be paid to those adolescents who repeatedly behave antisocially because they are at considerable risk for depressive symptoms. Other potential warning signs for depressive symptoms are versatile delinquent behaviour as well as specialization on violence and vandalism. Depressed females are at risk of subsequent antisocial behaviour.
TUTkimuksen tavoitteena oli analysoida itseilmoitettujen masennusoireiden ja epäosiaalisen käyttäytymisen välisiä yhteyksiä keskinuoruudessa poikkileikkaus- ja seurantatutkimusasetelmassa. Tutkimuksessa selvitettiin itseilmoitettujen masennusoireiden ja epäosiaalisen käyttäytymisen jatkuvuutta; itseilmoitettujen masennusoireiden, epäosiaalisen käyttäytymisen ja koetun sosiaalisen tuen välisiä keskinäisiä yhteyksiä; rikollisen käyttäytymisen muotoja masentuneilla ja epimasentuneilla nuorilla sekä itseilmoitettujen masennusoireiden ja epäosiaalisen käyttäytymisen välisiä pitkittäisyhteyksiä.


Masennusoireista kärsvien nuorten rikollinen käyttäytyminen oli monimuotoisempaa kuin eimasentuneilla nuorilla, jotka pääsääntöisesti erikoistuivat yhteen rikostyyppiin.


Tulokset osoittavat, että sekä masennusoireet että epäososiaalinen käyttäytyminen ovat pysyviä mielenterveyshäiriöitä keskinuuruddessa ja niiden samanaikaisairstavuus on huomattavan yleistä. Itselmoitetut masennusoireet vaikuttavat rikollisen käyttäytymisen muotoihin. Erityistä huomiota tulisi jatkossa kiinnittää niihin nuoriin, joiden epäososiaalinen käyttäytyminen on toistuvaa, sillä heidän masennusriskinsä on erityisen suuri. Muita mahdollisia nuoruusiaan masennusoireiden varomerkkejä ovat toistuva, monimuotoinen rikollinen käyttäytyminen sekä vandalismiin ja väkivaltaan erikoistuminen. Masennusoireista kärsvät tytöt ovat alttiita tulevalle epäososiaaliselle käyttäytymiselle.
1. INTRODUCTION

Depression and antisocial behaviour are among the most common mental health disorders in adolescents. It has been estimated that in general population one third of adolescents have experienced depression by the age of 19 (Lewinsohn et al. 1998). Similarly, although a certain degree of norm-violating or delinquent behaviour can be seen as a part of normal adolescent development, recurring and severe antisocial behaviour is not normative (Steinberg and Morris 2001, Stouthamer-Loeber and Loeber 2002). Estimates of severe antisocial behaviour have ranged from 5% to 10% in general child and adolescent population (Angold and Costello 2001). Antisocial behaviour in children/adolescents has increased remarkably in all developed countries in the past decades (Smith 1995, Costello et al. 2006). Similar conclusions have been reported for increased rates of adolescent depression (Fombonne 1998, Kessler and Walters 1998) or at least the identification of adolescent depression and preparedness in treatment seeking has improved (Parker and Roy 2001).

Depression and antisocial behaviour are accompanied by a range of psychosocial problems which may disturb adolescent development and psychosocial adjustment (Birmaher et al. 1996, Lewinsohn et al.1998, Rutter et al. 1998, McMahon and Frick 2005). In addition, depression and antisocial behaviour are among the most common reasons for adolescents being referred for psychiatric evaluation and treatment, yet many of these adolescents are still under-treated (Ritakallio et al. 2003, Sihvola et al. 2007). Comorbidity is very common in both disorders (Angold et al. 1999, Weller and Weller 2000). Costs and burden to society in adolescence and adulthood are substantial and affect multiple groups (Scott et al. 2001, Lynch and Clarke 2006). Thus, depression and antisocial behaviour can be considered a major public health problem.

Reportedly, depression and antisocial behaviour disorders have a fairly stable course in adolescence (Rutter et al. 2006). However, findings of possible sex differences in the continuity of these disorders have been mixed. In addition, most of the existing studies on antisocial behaviour have been conducted only among males. Although, comorbidity between depression and antisocial behaviour is well established (e.g. Angold et al. 1999), detailed information on the interrelations between these disorders is still needed. Specially, there are only few studies on the longitudinal associations between depression and antisocial behaviour, especially those conducted in general populations. Research on comorbidity between depression and antisocial behaviour and on
developmental associations is needed because it has implications for classification systems, etiology and treatment (Keiley et al. 2003).

2. REVIEW OF THE LITERATURE

2.1 Adolescent development

Adolescence is a challenging developmental stage which begins at puberty around age 11 for females and 13 for males. Adolescence ends around 22 years when a person has become physically, psychologically and sexually mature, has achieved emotional and financial autonomy and independence from parents, and an adult personal identity has developed. In this period a person’s biological, cognitive, psychological and social characteristics are changing rapidly as they become more adult-like. The essential challenge in adolescent development is to adapt to these changes (Aalberg and Siimes 1999, p. 55, Gutgesell and Payne 2004, Christie and Viner 2005). In contrast to popular belief, viewing adolescence as a extremely troublesome period, most recent studies have come to the conclusion that only about 20 - 25% of adolescents display extreme psychological and social disturbances as the majority of adolescents navigate through adolescence without major disturbances (Arnett 1999, Steinberg and Morris 2001, Gutgesell and Payne 2004).

Adolescence can be divided into three periods: early (around 11 to 14 years), middle (around 15 to 17 years) and late adolescence (around 18 to 21 years). Each period is characterised by a certain developmental task leading from one period to another, although individual variations and differences between sexes in the progression through these periods may be considerable. In addition, occasional regression (i.e. child-like characteristics and behaviours) are very common, and in fact, they are deemed essential to successful adolescent development (Aalberg and Siimens 1999, p. 55, Gutgesell and Payne 2004). The key developmental tasks of adolescent development are 1) the achievement of biological and sexual maturation, 2) the development of personal identity, 3) the development of intimate sexual relationships, 4) the establishment of independence and autonomy (Christie and Viner 2005).
Early adolescence entails rapid biological changes and reassessment of body image. Difficulties in impulse control, behavioural changes (e.g. fatigue, irritability and easy embarrassment), and rapid changes in mood, self-concept and interests as well as increased conflicts with parents are common at this stage. Early moral concepts, early sexual orientation and emotional separation from parents begin. The significance of and attachment to peers gradually become more important as closeness with parents and the amount of time spent with them diminishes. In middle adolescence biological changes are usually complete for females, whereas males are still maturing during this period. Abstract thinking and an understanding of law and morality proceed, likewise the development of personal and sexual identity. Intimate and romantic relationships come into the picture. In late adolescence the capability for complex abstract thought is acquired, and identity is differentiated and organised. Equal intimate relationships are gradually achieved. This period is characterised by further development of emotional, social and financial independence from parents as decisions about professional and educational goals, leaving home and starting a family become topical. The parent-adolescent relationship becomes more egalitarian and less contentious. Although the significance of the family as a source of social support decreases during adolescent development, the social support from parents still seems to have the most efficient effect in buffering adolescents against internalizing and externalizing problems. Friendships have become to be intimate, supportive and close (Garnefski and Diekstra 1996, Aalberg and Siimes 1999, p. 55, Marttunen and Rantanen 1999, Garnefski 2000, Bru et al. 2001, Steinberg and Morris 2001, Gutgesell and Payne 2004, Christie and Viner 2005). During adolescent development a person’s ability to consider the long-term consequences of his/her actions, and his/her awareness of the responsibility and of the effects of his/hers actions on other people increases (Rutter et al. 1998, p. 28).

2.2 Depression in adolescence

2.2.1 Definition of depression

Depression is often used in casual language to refer to lowered mood or depressive feelings as a reaction to loss or adverse life-events. These temporary “ups and downs” are common to everybody. The most important distinction between depressive feelings and depression as a disorder is that depression is characterized by core persistent and pervasive depressed mood and anhedonia
associated with significant psychosocial functional impairment (Zalsman et al. 2006). However, in the earlier literature, the term depression has been used rather inconsistently as some authors (e.g. Oldehinkel et al. 1999) use depression to refer to solely clinically diagnosed major depression disorder (MDD) based on diagnostic criteria, whereas in other studies (e.g. Glied and Pine 2002) self-reported depressive symptoms based on high rating scale scores are also referred to as depression. The major difference between these perspectives is that disorders based on diagnostic criteria “are based on specific, operationalized criteria with a certain number of clearly described symptoms required, occurring with sufficient and specified frequency, intensity, or duration, or a combination of these” (King et al. 2005, p. 3063). Thus, diagnostic classifications (e.g. DSM-IV, APA 1994 and ICD-10, STAKES1997) represent a categorical approach which implies that disorder is either present and absent. This approach works best when there are clear boundaries between diagnostic classes and when classes are mutually exclusive (APA 2000, p. xxxi, Broberg et al. 2001, Hankin 2006).

Self-reported depression is based on subjects’ own perception and evaluation of depressive symptoms based on a selected symptom checklist. Depression is seen as a dimensional continuum in which depressive symptoms vary from non-existent to severe, and there is no sharp boundary between non-depressed and depressed adolescents. Adolescents scoring above a specified cut-off point are considered to be in need of clinical attention, and these symptoms are likely to reach clinical levels over time (Gotlib et al. 1995, Hankin 2006). In fact, several studies (e.g. Kessler and Walters 1998, Oldehinkel et al. 1999, González-Tejera et al. 2005, Sihvola et al. 2007) have shown that a substantial proportion of adolescents with symptoms of depression accompanied by psychosocial functional impairment fail to meet the diagnostic criteria for MDD. These adolescents nevertheless manifest significant impairment and rates of comorbidity and they use a lot of mental health services (Gotlib et al. 1995, Lewinsohn et al. 1998, González-Tejera et al. 2005, Rutter et al. 2006). Therefore it is important also to study depression from a dimensional perspective.

According to the DSM-IV (APA 1994, p. 339) MDD is characterized by one or more major depressive episodes (MDE) without a history of manic, hypomanic or mixed episodes. The diagnosis of MDD requires a two-week period of either depressed mood or loss of interest/pleasure and, in addition at least 4 of the following symptoms: significant weight changes or appetite disturbance, insomnia/hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or guilt, impaired concentration or thinking ability and thoughts of death or suicidality (Table 1). The diagnostic criteria for MDD are presented only according to the DSM
diagnostic classification because it is used more in epidemiological studies than the ICD classification.

Table 1. DSM-IV criteria for Major Depressive Episode (APA 1994, 327).

| A. Five (or more) of the following symptoms have been present during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure. |
| Note: Do not include symptoms that are clearly due to a general medical condition, or mood-incongruent delusions or hallucinations. |
| (1) depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g. feels sad or empty) or observation made by others (e.g. appears tearful). Note: In children and adolescents, can be irritable mood. |
| (2) markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation made by others) |
| (3) significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. Note: In children, consider failure to make expected weight gains. |
| (4) insomnia or hypersomnia nearly every day |
| (5) psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down) |
| (6) fatigue or loss of energy nearly every day |
| (7) feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick) |
| (8) diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others) |
| (9) recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide |
| B. The symptoms do not meet criteria for a Mixed Episode. |
| C. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning. |
| D. The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition (e.g., hypothyroidism) |
| E. The symptoms are not better accounted for the Bereavement, i.e., after the loss of a loved one, the symptoms persist for longer than 2 months or are characterized by remarked functional impairment, morbid preoccupation with worthlessness, suicidal ideation, psychotic symptoms, or psychomotor retardation. |
2.2.2 Features of adolescent depression

The clinical features of depression are basically very similar among children, adolescents and adults, although the symptom profile varies slightly according to age (Marttunen and Pelkonen 1998, Masi et al. 1998, APA 2000, p. 353, Kessler et al. 2001). Changes in the symptom profile of depression seem to be timed around puberty (Hankin 2006). According to DSM-IV there are two exceptions between symptom profiles with age: among children and adolescents mood may be irritable instead of depressed and failure to make expected weight gains may be considered along with weight loss (APA 1994, p. 327). The most typical symptoms of adolescent depression are depressed mood, loss of interest or pleasure, concentration or thinking difficulties and sleep disturbances (Roberts et al. 1995, Lewinsohn et al. 1998, Marttunen and Pelkonen 1998, Haarasilta et al. 2001, Sihvola et al. 2007). Thoughts of death/suicide have been found to be among the least frequent symptoms among depressed adolescents, at least in community samples (Roberts et al. 1995, Lewinsohn et al. 1998, Haarasilta et al. 2001).

Differences in the symptom profiles of depression between clinical and non-clinical adolescent samples have been little studied (Roberts et al. 1995). The existing data suggests that in general, symptoms of depression are fairly similar in both samples (Roberts et al. 1995, Marttunen and Pelkonen 1998) but there is some evidence that e.g. weight/appetite disturbances and sleep abnormalities tend to be more prevalent in community samples (Lewinsohn et al. 1998). Suicidal tendencies have been found to be less prevalent among depressed adolescents in community samples than among clinically referred counterparts (Roberts et al. 1995, Lewinsohn et al. 1998). Predictably, referred adolescents are likely to be overall more severe depressed than depressed adolescents in the community (Hankin and Abramson 1999). Also, co-occurrence with other mental disorders (comorbidity) is consistently more frequent in clinical than community samples (e.g. Lewinsohn et al. 1995a, Hankin and Abramson 1999), but this is likely be a consequence of overpresentation of comorbid adolescents in clinical samples than a true difference in the symptom profiles given that comorbid adolescents are more likely to receive treatment than non-comorbid adolescents (Angold et al. 1999).

Some gender differences in symptom profile and severity of adolescent depression have been reported by some authors, but the results are inconsistent (Roberts et al. 1995, Hankin et al. 1998, Lewinsohn et al. 2003). Weight/appetite disturbance, feelings of worthlessness/guilt, self-blame,
negative body image, concentration problems, fatigue, suicidality and health worries may be more frequent among depressed females than males (Lewinsohn et al. 1998, Liss et al. 2001, Yorbik et al. 2004, Bennett et al. 2005). Males may express more disturbances in school work and anhedonia than females (Lewinsohn et al. 2003, Bennett et al. 2005).

2.2.3 Identifying depression

Depression can be measured through diagnostic interviews and rating scales in which adolescent, parents and teachers can be used as informants (AACAP 1998). In fact, many instruments do have parallel versions for different informants (e.g. Shaffer et al. 1996, Achenbach 2000). Multifaceted information is useful to capture a different profile of symptoms which may be observed in different settings (home vs. school) (AACAP 1998). On the other hand, adults may be unaware of an adolescent’s depression (Cantwell et al. 1997) resulting in a low agreement between informants (Sanford et al. 1995, Verhulst et al. 1997, Sourander et al. 1999). In general, adolescents are considered to be valid informants of their own depression (Cantwell et al. 1997, Lewinsohn et al. 1998, Hankin and Abramson 1999).

Diagnostic interviews can be divided by the level of structure or standardization into unstructured, semi-structured and highly structured interviews; of these semi-structured and highly structured diagnostic interviews are mostly used in research settings (Reitman et al. 1998, Roberts et al. 1998, McClellan and Werry 2000). As semi-structured interviews (or interviewer-based interviews) provide only broad guidelines for items to be elicited and allow interviewers to use their own probe questions, they therefore rely on the interviewer’s clinical expertise (Reitman et al. 1998, McClellan and Werry 2000). The limitations are time-consuming and cost (King et al. 2005). K-SADS (The Schedule for Affective Disorders and Schizophrenia for School-Aged Children; Kaufman et al. 1997) and CAPA (The Child and Adolescent Psychiatric Assessment; Angold et al. 1995) are examples of semi-structured interviews. The advantage of highly structured diagnostic interviews (or respondent-based interviews) is superior diagnostic reliability as they minimize the role of the interviewer using predetermined standardized questions in a rigid sequence presented precisely the same way to all participants (McClellan and Werry 2000, King et al. 2005). Due to a specified protocol, highly structured interviews can be administered by trained lay interviewers (Shaffer et al. 1996, Reitman et al. 1998). DISC (Diagnostic Interview Schedule for Children; Shaffer et al. 1996)
is an example of highly structured interviews. The limitation of interviews is that they do not usually contain normative data as most rating scales do (Reitman et al. 1998). Further, diagnostic interviews do not provide exact guidelines on how to determine the clinically significant impairment required in diagnosis (Kessler et al. 2001).

Rating scales can be completed by informants as questionnaires or they can be presented as interview questions (AACAP 1998). Using rating scales enables comparisons between an adolescent’s level of depression and a reference group of the same age and gender (e.g. Achenbach 1991). The major limitation of the rating scales is that they cannot be used as diagnostic instruments as they rely on person’s own perception and evaluation of depressive symptoms. In fact, rating scales have been criticized for poor specificity (Kessler et al. 2001). However, some recent studies have reported self-reported depressive symptoms to be approximately equivalent to clinically diagnosed disorders (e.g. Boyle et al. 1997, Morgan and Cauce 1999, Lasa et al. 2000). For example, Morgan and Cauce (1999) reported that Youth Self-Report (YSR; Achenbach 1991) predicted a diagnosis of depression determined by the DISC with a specificity of 90%. In addition, self-reported depressive symptoms have been reported to be persistent and to be associated with significant psychosocial impairment both in adolescence and in adulthood (Ferdinand et al. 1995, Gotlib et al. 1995, Glied and Pine 2002, Twenge and Nolen-Hoeksema 2002). In fact, there is evidence that adolescents who scored high on a depression questionnaire did not differ significantly on psychosocial dysfunction compared to adolescents meeting the diagnostic criteria for depression (Gotlib et al. 1995). The most used rating scales in measuring adolescent depression are the Children Depression Inventory (CDI), the Beck Depression Inventory (BDI), the Hamilton Rating Scale for Depression (HRSD), the Reynolds Adolescent Depression Scale (RADS) and the Center for Epidemiological Studies-Depression Scale (CES-D) (Myers and Winters 2002).

2.2.4 Epidemiology of adolescent depression

2.2.4.1 Methodological issues in epidemiological studies on adolescent depression

The prevalence of a disorder is defined as the proportion of the population with a disorder in a given timeframe (e.g. current, 12 months or lifetime). Incidence is defined as the rate at which new cases
arise in a given period of time (Lewinsohn et al. 1998, Costello et al. 2006). Earlier epidemiological studies have reported wide variation in the prevalence and incidence rates of adolescent depression. Several factors contribute to the wide variability in rates including sample characteristics, assessment instruments, diagnostic criteria and number of informants used, and whether an additional criterion for functional impairment has been required (Roberts et al. 1998, Hankin and Abramson 1999, Oldehinkel et al. 1999).

In community studies on adolescent depression sample size has ranged widely from a few hundred to several thousand (Fergusson et al. 1993, Lewinsohn et al. 1993, Verhulst et al. 1997, Wittchen et al. 1998, Haarasila et al. 2001, Kaltiala-Heino et al. 2001, Millikan et al. 2002, Rushton et al. 2002, Walker et al. 2005). In general, sample sizes are larger in rating scales based studies than in interview based studies. Considering sample size is important, because due to very large sample size minor differences without any clinical importance may reach a statistically significant level, but on the other hand, in smaller samples “true” significant differences may not be discovered statistically (Läärä and Lammi 1989, p. 224). Many studies (especially interview based studies) have used random sampling (e.g. Wittchen et al. 1998, Boyd et al. 2000, Romano et al. 2001), which increases the representativeness of the samples. Birth cohort studies following unselected samples of children from birth to adulthood (e.g. Fergusson et al. 1993, Newman et al. 1996) are unique in their representativeness. The age and gender distributions of the sample are significant factors for generalizability (Roberts et al. 1998) given that the occurrence of depression changes dramatically with adolescent development (Marttunen and Pelkonen 1998, Twenge and Nolen-Hoeksema 2002, Angold and Costello 2006), and therefore a large age range determines a more comprehensive picture of the development of adolescent depression than does some specific age. On the other hand, estimates from prepubertal and postpubertal samples are not comparable. The sex ratio of the sample is pivotal because depression is far more prevalent among adolescent females than males (e.g. Newman et al. 1996, Oldehinkel et al. 1999). Regarding school-based samples, estimates of depression may be underestimated since school non-attenders are omitted from the estimates.

In general, self-report rating scales tend to yield higher estimates of depression than diagnostic interviews (Kessler et al. 2001) although different timeframes hamper comparisons greatly. Estimates of depression vary widely according to different informants, but in general, at least among older adolescents, the prevalence rate is higher according to adolescent than parent report (Verhulst et al. 1997, Romano et al. 2001). As there is uncertainty as to how best to combine
information from multiple informants, it is recommended to report rates separately by informant (Roberts et al. 1998, Kessler et al. 2001).

Lastly, incompatibility of results presentation across studies hampers comparability of studies (Roberts et al. 1998). Studies have used different timeframes of prevalence varying between the present to lifetime. Unfortunately, the results are sometimes presented inadequately as the timeframe for example is not clearly presented (e.g. Schraedley et al. 1999) or a number of respondents is missing (e.g. Kessler and Walters 1998). Therefore, making a critical review of the findings is rather difficult.

2.2.4.2 Prevalence and incidence of adolescent depression

Depression is one of the most common mental disorders among adolescents. In fact, it has been estimated that in general population one third of adolescents have experienced depression by the age 19 which corresponds to the estimates from adult populations (Lewinsohn et al. 1998). In diagnostic interview based studies in general population the current prevalence of adolescent depression has ranged from 0.5% to 3.4% (Fergusson et al. 1993, Lewinsohn et al. 1993), 3-month prevalence has ranged from 0.5% to 4.4% (Simonoff et al. 1997, Costello et al. 2003, Gau et al. 2005), 6-month prevalence has ranged from 0.4% to 7.7% (Verhulst et al. 1997, Romano et al. 2001) and 12-month prevalence has ranged from 2.2% to 21.5% (Fergusson et al. 1993, Kessler and Walters 1998, Wittchen et al. 1998, Oldenhinkel et al. 1999). The lifetime prevalence of adolescent depression has varied from 5.4% to 24.8% in diagnostic interview based studies (Lewinsohn et al. 1993, Kessler and Walters 1998, Wittchen et al. 1998, Oldenhinkel et al. 1999). According to rating scales in general population, estimates of prevalence of adolescent depression have ranged from 2.8% to 32.4% (Connelly et al. 1993, Ivarsson and Gillberg 1997, Wichstrom 1999, Boyd et al. 2000, Glied and Pine 2002, Millikan et al. 2002, Rushton et al. 2002, Walker et al. 2005, Maharajh et al. 2006, Chabrol et al. in press).

Recent Finnish diagnostic interview based studies conducted in general population have yielded corresponding rates of adolescent depression as estimates have ranged from 0.9% to 7.8%

Depression is fairly rare in childhood, as reported prevalence rates have varied from 0.4% to 2.5% (Birmaher et al. 1996). The prevalence of depression increases in both sexes after puberty (Birmaher et al. 1996, Marttunen and Pelkonen 1998, Hankin 2006). For example, in a Dunedin birth cohort 12-month prevalence of depression increased significantly over a 10-year period: 1.1% at age 11, 2.1% at age 13, 2.8% at age 15, 16.8% at age 18 and 17.9% at age 21 (Hankin et al. 1998). It is not yet clear why the prevalence of depression increases during adolescent development as diverse biological (e.g. changing levels of estrogen and testosterone), psychosocial (e.g. changes in social roles) and cognitive factors (e.g. ruminative style) have been reported to be possible explanations to the rise (AACAP 1998, Costello et al. 2002).

The incidence of adolescent depression increases around ages 13 and 14, and it is estimated to be at its highest between the ages of 15 and 18 (Hankin et al. 1998, Oldehinkel et al. 1999). 12 to 20-month incidence has been reported to range from 3.3% to 5.7% among 11 to 18-year-olds (Lewinsohn et al. 1993, Garrison et al. 1997, Oldehinkel et al. 1999). The rate of new cases of depression decreases in adulthood, indicating that the majority of adult depression can be explained by a background of adolescent depression (Kim-Cohen et al. 2003, Rutter et al. 2006). For example, Newman et al. (1996) reported that 70.2% of those who were depressed at age 21 had been previously diagnosed at ages 11, 13, 15 or 18.

In childhood, rates of depression are approximately the same for both genders (AACAP 1998, Angold and Costello 2006), in spite of some evidence that in childhood females’ rates may be lower than males’ (Angold et al. 1998, Cyranowski et al. 2000, Twenge and Nolen-Hoeksema 2002). After puberty the gender ratio changes dramatically, as numerous studies (e.g. Fergusson et al. 1993, Newman et al. 1996, Oldehinkel et al. 1999, Schraedley et al. 1999, Wichstrom 1999, Fröjd et al. 2006a) have consistently shown that adolescent females are about twice as likely to be depressed than males. The gender difference emerges first time in early adolescence around the ages of 12 and 15 (Twenge and Nolen-Hoeksema 2002, Angold and Costello 2006), but the greatest increase in
gender difference is estimated to emerge between ages 15 and 18 (Hankin et al. 1998). It seems that female predominance in depression is explained explicitly by different incidence rates. However, the underlying mechanisms for the predominance of depressed females are so far unclear, as it seems that multiple processes may contribute to the development of this gender difference (Hankin et al. 1998, Hankin and Abramson 1999, Angold and Costello 2006). Gender differences have been explained by females’ tendency to carry more risk factors for depression and to face more social and biological challenges in adolescent development than males (Nolen-Hoeksema and Girgus 1994, Hankin and Abramson 1999). Pubertal status accompanied by biological, hormonal and psychosocial factors has also been reported to explain the difference (Angold et al. 1998, Cyranowski et al. 2000).

Some researchers (e.g. Birmaher et al. 1996a, Fombonne 1998, Kessler and Walters 1998) but not all (e.g. Twenge and Nolen-Hoeksema 2002, Costello et al. 2006) have reported that the prevalence of adolescent depression has increased, and the age at onset of depression has decreased in recent birth cohorts. However, as Parker and Roy (2001) stated, this phenomenon can be at least partly explained by destigmatization, improved identification of depression or increased willingness to seek treatment. In Finland there seems to be no evidence of a vast increase in rates of depressive symptoms among adolescents (Luopa et al. 2006), but there may have been some increase among children in past decades (Sourander et al. 2004).

2.2.5 Etiology of adolescent depression

Depression is a multietiological disorder in which many genetic, biological/somatic, psychological, psychosocial and sociodemographic factors usually interact in combination at the onset of depression. Previous and/or comorbid psychopathology also increases the risk for depression (Birmaher et al. 1996, AACAP 1998, Masi et al. 1998, Lagges and Dunn 2003). However, many factors identified with onset of depression are in fact correlates or associations (Costello et al. 2002) as they have been discovered by cross-sectional designs. Evidence suggests that accumulation of risk factors has a cumulative effect on the risk of depression (Lewinsohn et al. 1998). In addition, some of these factors are associated with both onset and maintenance of depression (Lewinsohn et al. 1998, Parker and Roy 2001), and many of the etiological factors seem also to be non-specific to
depression as they also increase the risk of other psychiatric disorders (Birmaher et al. 1996, Kessler et al. 2001).

**Genetic factors**

Several studies on adult samples have shown that depression is a familial and heritable disorder. Although less studied among adolescents, heritability has been reported to result in a two- to fourfold risk for depression among first-degree relatives. Genetic factors seem to account for at least 50% of the variance of depression (Todd and Botteron 2002, Lagges and Dunn 2003, Zalsman et al. 2006). However, it seems that genes interact with other predisposing factors such as maladaptive parenting or weak parent-child bonding, which are common in families with parental depression (Kessler et al. 2001, Parker and Roy 2001, Zalsman et al. 2006, Isometsä 2007). Moreover, adolescents at high genetic risk appear to be more sensitive to the other etiological factors (psychosocial stressors) than those at low genetic risk (Hankin 2006).

**Biological/somatic factors**

Biological factors of depression have mostly been studied among depressed adults. Given that many of the neurobiological factors associated with the pathophysiology of adult depression are not fully developed in adolescence, it is at least partly uncertain whether the results from adult samples can be generalized to adolescent depression (Kaufman et al. 2001, Garber 2006, Hankin 2006). The crucial biological factors of depression are reviewed below.

Neurochemical changes, that is dysregulation in the serotonergic, noradrenergic and dopaminergic systems seem to play an important role in the etiology of depression. These neurotransmitters are closely interrelated. Dysregulation in the serotonergic system has been studied most. Serotonin is a regulator e.g. of mood, sleep and appetite. Several studies have reported that people with depression have reduced serotonergic function, and lowered concentration of a metabolite of serotonin (5-HIAA) has been found in the cerebrospinal fluid. Reduced serotonergic function is associated especially with impulsive and aggressive suicidality. The serotogenic system seems to be at least partly genetically regulated (Mervaala and Räsänen 2004, Isometsä 2007).

There also is evidence of functional and anatomic brain alterations in depression as e.g. metabolism of prefrontal cortex is decreased among depressed individuals. Many hormonal abnormalities are
associated with depression; of these one of the most important is dysregulation in the hypothalamic pituitary-adrenocortical (HPA) axis. In depression the function of the HPA axis is hyperactivated caused by hypersecretion of corticotrophin releasing factor (CRF). As a result of dysregulation in the HPA axis, high cortisol concentrations are reported among depressed individuals. Similarly, thyroid dysfunction has been reported to be associated with depression as both hypothyroidism and hyperthyroidism can result in depressive symptoms (Isometsä 2007).

Poor self-perceived health and chronic physical illnesses (e.g. epilepsy, migraine, asthma and allergy) have also been reported to raise vulnerability to depression (Lewinsohn et al. 1998, Lagges and Dunn 2003, Haarasilta et al. 2005, Karlsson et al. 2005).

**Psychological factors**


**Psychosocial factors**

Poor social skills and problems with social interaction and various school problems as psychosocial stressors may expose adolescents to depression (Birmaher et al. 1996, AACAP 1998, Lewinsohn et al. 1998, Masi et al. 1998, Pelkonen et al. 2003). Lack of social support from friends and peer rejection increase vulnerability to depression (Steinhausen and Winkler Metzke 2000, Kaltiala-Heino et al. 2001, Pelkonen et al. 2003). Stressful life-events (e.g. parental divorce, loss events or bullying) and overall stress seem also to increase vulnerability to depression. In fact, it has been estimated that almost all depressed adolescents have experienced at least one significant negative life event in the month before to the onset of depression (Lewinsohn et al. 1998, Kaltiala-Heino et al. 1999a, Schraedley et al. 1999, Patton et al. 2003, Hankin 2006). Parental psychopathology, especially depression, substance abuse and criminality have been consistently associated with increased risk for adolescent depression (Birmaher et al. 1996, AACAP 1998, Beardslee et al. 1998, Kessler et al. 2001, Zalsman et al. 2006). Frequent interfamily conflicts, broken family, problems

Psychopathology

Externalizing (e.g. bullying, aggression, delinquency) and internalizing symptoms (e.g. shyness, feeling anxious, behavioural inhibition) are associated with increased risk for adolescent depression (Lewinsohn et al. 1998, Kaltiala-Heino et al. 2000, Parker and Roy 2001, Pelkonen et al. 2003). A previous episode of depression undoubtedly increases the risk for subsequent depression (Lewinsohn et al. 1998, Birmaher et al. 2002, Rutter et al. 2006) likewise a history of suicide attempt (Lewisohn et al. 1998), anxiety disorders (AACAP 1998, Lewinsohn et al. 1998) and problematic substance use (Gilvarry 2000, Rey et al. 2002, Fröjd et al. 2006a) has been reported to be associated with depression.

Sociodemographic factors

Some sociodemographic factors (e.g. age, gender, low SES, single-parent household, low parental education or unemployment) have been found to be associated with increased risk for depression (Birmaher et al. 1996, Schraedley et al. 1999, Kaltiala-Heino et al. 2001, Rushton et al. 2002).

2.2.6 Course and consequences of adolescent depression

The mean duration of a depressive episode in adolescence varies according to referral status, being approximately 4 - 9 months in clinical samples, compared to 3 – 7 months in community samples (Birmaher et al. 2002). According to community studies, between 75 and 90% of depressed adolescents recovered from depression in a follow-up of 6 – 24 months (Birmaher et al. 2002), but a small minority of depressed adolescents (5-10%) will suffer from chronic, severe depression for several years (Birmaher et al. 1996, Kessler et al. 2001, Birmaher et al. 2002). Longer duration seems to be associated with early age of onset, severity of depression, suicidality, poor psychosocial

Both clinical (e.g. Sanford et al. 1995, Weissman et al. 1999, Fombonne et al. 2001a) and community studies (e.g. Hankin et al. 1998, Beyers and Loeb 2003, Costello et al. 2003, Kim-Cohen et al. 2003) have consistently shown adolescent depression to be highly recurrent both in later adolescence and in adulthood (Rutter et al. 2006). In later adolescence, approximately 40 – 50% of depressed adolescents experience a relapse during remission (AACAP 1998), and 20 – 70% of them will have at least one recurrent episode in 1 - 6 years (AACAP 1998, Birmaher et al. 2002, Zalsman et al. 2006). For instance, Costello et al. (2003) found that adolescents with a history of depression were four times more likely than those with no previous depression to have depression in later adolescence. In adulthood about 40 – 70% of depressed adolescents will experience recurrent depression resulting a two to sevenfold risk of being depressed compared to non-depressed adolescents (Rutter et al. 2006). Risk of recurrence in adolescent depression is associated with early age at onset, greater number of previous episodes, severity of previous depression, psychosis, comorbidity, suicidal attempts, negative attributional style, exposure to stress, familial depression, low SES and lack of compliance with treatment (AACAP 1998, Masi et al. 1998, Birmaher et al. 2002, Karlsson et al. 2006a). Evidence regarding gender differences in recurrence rate is inconsistent, as some studies (Ferdinand et al.1995, Hankin et al. 1998, Kovacs et al. 2003) found no gender differences in recurrence of depression, but others (Oldehinkel et al. 1999, Costello et al. 2003, Lewinsohn et al. 2003) found females to be more likely to have recurrences than males. The stability or continuity described above represents homotypic continuity in which manifestations of the disorder in question change relatively little over time so that diagnosis remains the same at different assessments (Angold et al. 1999, Costello et al. 2003).

Given that adolescent depression occurs during an important developmental period it is not surprising that adolescent depression is associated with many adverse psychosocial consequences in multiple domains. Adolescent depression, especially recurrent depression, is associated with poor psychosocial functioning (e.g. poor coping skills and academic performance, problems in social relationships, negative attributional styles and lower level of self-esteem) and disturbances (e.g. substance misuse, suicidality), comorbid disorders (e.g. antisocial behaviour and anxiety disorders), increased physical problems, smoking, obesity and early pregnancy (Sanford et al. 1995, Birmaher

2.2.7 Comorbidity in adolescent depression

Comorbidity is defined as the co-occurrence of two (or more) different disorders in a defined period of time (e.g. concurrent, 6 months or lifetime comorbidity). Comorbidity can be divided into homotypic comorbidity (comorbidity within one diagnostic grouping) and heterotypic comorbidity (comorbidity between disorders from different diagnostic groupings) (Angold et al. 1999). Studying comorbidity is indicated, as in general comorbid disorders may lead to more severe symptoms, increased psychosocial impairment and increased suicidality as well as complicated treatment than single disorders (Newman et al. 1996, Pelkonen et al. 1997, Lewinsohn et al. 1998, Loeber et al. 2000a, Karlsson et al. 2006b).

Comorbidity is so common among depressed adolescents that it can be considered the rule rather than the exception (Weller and Weller 2000, Kessler et al. 2001, Parker and Roy 2001). Approximately 40 – 70% of depressed adolescents have at least one comorbid disorder, and 20 – 50% of them have at least two comorbid disorders. Among the most common comorbid disorders are anxiety disorders (15 – 80%), antisocial behaviour (10 – 80%), ADHD (10 – 60%) and substance abuse (20 – 30%) (Birmaher et al. 1996, Masi et al. 1998, Angold et al. 1999). Depressed females are more likely than males to have at least one comorbid anxiety disorder (Kessler et al. 2001), whereas comorbidity between antisocial behaviour and substance abuse is more common among depressed males (Kessler et al. 2001, Kovacs et al. 2003, Karlsson et al. 2006b). In general, the majority of the studies have found depression to be temporally secondary to other disorders. However, comorbid substance abuse may be an exception, as depression has been found to precede
substance abuse by several years (Birmaher et al. 1996, Parker and Roy 2001). This finding may be due to the longer time to reach diagnostic level in substance abuse/dependence than to manifest depression (Angold et al. 1999).

Comorbidity between depression and antisocial behaviour will be discussed detailed in Chapter 2.4.

2.3 Antisocial behaviour in adolescence

2.3.1 Definition of antisocial behaviour

Antisocial behaviour is a form of behaviour which violates social norms and rules and/or the rights of others (APA 2000, p. 93). Many adolescents commit some antisocial acts in the form of testing limits, challenging rules and seeking excitement, but most of these acts are non-serious in nature, will not persist over a long period and do not require psychiatric treatment. This kind of behaviour may be seen as part of a developmental process in which prosocial behaviours and social rules are adopted. However, when antisocial behaviour develops into a persistent pattern demonstrating a maladaptive trajectory, psychiatric evaluation and interventions are indicated (AACAP 1997, Loeber and Farrington 2000, Steinberg and Morris 2001, Stouthamer-Loeber and Loeber 2002, Karnik et al. 2006). In the literature on antisocial behaviour the terms delinquency, antisocial behaviour/conduct problems, conduct disorder and oppositional defiant disorder, disruptive disorders and externalizing disorders have been used rather inconsistently. Although these terms are often interrelated and the conditions they refer to occur within same adolescents, they are not synonymous, as they all have their own meanings and perspectives (AACAP 1997, Hill 2002).

Delinquency

Delinquency is a legal term referring to criminal, officially unlawful behaviour. Thus, the behaviour in question is viewed from a legal perspective (AACAP 1997, Vermeiren 2003). The term delinquent (i.e. offender) is usually used to refer adolescents who have been in contact with the police and have been sentenced/ incarcerated (Waddell et al. 1999, Bassarath 2001), but as Deptula
and Cohen (2004) noted, there is no consistent standard to measure delinquency, and therefore delinquent behaviour is defined rather differently across studies. In addition to this, as the age of criminal responsibility between countries differs significantly (e.g. in Finland 15 years vs. in United States 7 years), comparisons across countries are complicated, as crimes are not compiled uniformly in official statistics (Rutter et al. 1998, p. 26). Delinquent behaviours can be divided into status offences (e.g. behaviours which are illegal only for children/adolescents such as alcohol consumption) and criminal offences (e.g. behaviours which are against the law in any age group (Pajer 1998, McMahon and Frick 2005).

**Antisocial behaviour/conduct problems**

Antisocial behaviour (conduct problems) can be considered as an umbrella term in respect to other terms referring to antisocial behaviour, as it refers broadly to all acts that are considered inappropriate because they contravene the norms and principles of society or harm others/society or both (e.g. frequent lying, substance use/abuse, truancy, running away, disobedience, stealing, fire-setting, violence or vandalism). Some antisocial behaviours may be also delinquent but not all (AACAP 1997, Bassarath 2001, Hill 2002, Vermeiren 2003). In addition, although antisocial behaviour often includes features similar to conduct and oppositional defiant disorders, not all antisocial behaviour is automatically psychopathological nor does it require psychiatric treatment, as do conduct and oppositional defiant disorders (AACAP 1997).

**Conduct disorder**

Conduct disorder (CD) is psychiatric, diagnostic term referring to a group of antisocial and aggressive symptoms in which a repetitive and persistent pattern is a key symptom but in addition to this the antisocial behaviour must cause clinically significant impairment in social, academic or occupational functioning to fulfil the diagnostic criteria of conduct disorder (APA 1994, p. 90, AACAP 1997, Waddell et al. 1999, Earls and Mezzacappa 2002). CD is described in DSM-IV as “a repetitive and persistent pattern of behaviour in which the basic rights of others or major age-appropriate societal norms or rules are violated” (APA 1994, p.85). According to DSM-IV (APA 1994, p. 90) CD includes serious aggressive and nonaggressive behaviours, deceitfulness or theft
and serious rule violations (Table 2). Adolescents with conduct disorder are often also involved in delinquency, but these terms are not synonymous as the criteria for conduct disorder include some behaviours which are not against the law. In addition to this, many delinquents do not show the social impairment and psychosocial dysfunction required for a diagnosis of conduct disorder. In fact, it has recently been estimated that approximately 30-70% of delinquents do not fulfil the diagnostic criteria for conduct disorder (APA 1994, p. 90, Rutter et al. 1998, p.1, Bassarath 2001, Vermeiren 2003).
Table 2. DSM-IV criteria for Conduct Disorder (APA 1994, 90).

A. A repetitive and persistent pattern of behavior in which the basic rights of others or major age-appropriate societal norms or rules are violated, as manifested by the presence of three (or more) of the following criteria in the past 12 months, with at least one criterion present in the past 6 months:

Aggression to people and animals
(1) often bullies, threatens, or intimidates others
(2) often initiates physical fights
(3) has used a weapon that can cause serious physical harm to others (e.g., a bat, brick, broken bottle, knife, gun)
(4) has been physically cruel to people
(5) has been physically cruel to animals
(6) has stolen while confronting a victim (e.g., mugging, purse snatching, extortion, armed robbery)
(7) has forced someone into sexual activity

Destruction of property
(8) has deliberately engaged in fire setting with the intention of causing serious damage
(9) has deliberately destroyed others’ property (other than by fire setting)

Deceitfulness or theft
(10) has broken into someone else’s house, building or car
(11) often lies to obtain goods or favors or to avoid obligations (i.e., “cons” others)
(12) has stolen items of nontrivial value without confronting a victim (e.g., shoplifting, but without breaking and entering; forgery)

Serious violations of the rules
(13) often stays out at night despite parental prohibitions, beginning before age 13 years
(14) has run away from home overnight at least twice while living in parental or parental surrogate home (or once without returning for a lengthy period)
(15) is often truant from school, beginning before age 13 years

B. The disturbance in behavior causes clinically significant impairment in social, academic, or occupational functioning.

C. If the individual is age 18 years or older, criteria are not met for Antisocial Personality Disorder.

Specify type based on age at onset:
Childhood-Onset Type: onset of at least one criterion characteristic of Conduct Disorder prior to age 10 years
Adolescent-Onset Type: absence of any criteria characteristic of Conduct Disorder prior to age 10 years

Specific severity:
Mild: few if any conduct problems in excess of those required to make the diagnosis and conduct problems cause only minor harm to others
Moderate: number of conduct problems and effect on others intermediate between “mild” and “severe”
Severe: many conduct problems in excess of those required to make the diagnosis or conduct problems cause considerable harm to others
Oppositional defiant disorder

Oppositional defiant disorder (ODD) is defined in DSM-IV (APA 1994, p. 91) as a “recurrent pattern of negativistic, defiant, disobedient, and hostile behaviour toward authority figures that persists for at least 6 months” and which causes clinically significant impairment in social, academic or occupational functioning. ODD consists of often recurring behaviours such as annoying other people, blaming others for own mistakes, refusing to comply with adult’s requests or losing one’s temper (Table 3). Recurrent disobedient and hostile behaviour is aimed toward authority figures (e.g. parents or teachers) but adolescents with ODD do not usually violate the rights of others as do adolescents with CD (McMahon and Frick 2005). Therefore ODD is viewed as a milder form than CD (APA 1994, p. 93, Earls and Mezzacappa 2002, McMahon and Frick 2005). The diagnostic criteria of CD and ODD are presented only according to the DSM diagnostic classification, because this is more generally used in epidemiological studies than is the ICD classification.

Table 3. DSM-IV criteria for Oppositional Defiant Disorder (APA 1994, 93).

<table>
<thead>
<tr>
<th>A. A pattern of negativistic, hostile, and defiant behavior lasting at least 6 months, during which four (or more) of the following are present:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) often loses temper</td>
</tr>
<tr>
<td>(2) often argues with adults</td>
</tr>
<tr>
<td>(3) often actively defies or refuses to comply with adults’ requests or rules</td>
</tr>
<tr>
<td>(4) often deliberately annoys people</td>
</tr>
<tr>
<td>(5) often blames others for his or her mistakes or misbehavior</td>
</tr>
<tr>
<td>(6) is often touchy or easily annoyed by others</td>
</tr>
<tr>
<td>(7) is often angry and resentful</td>
</tr>
<tr>
<td>(8) is often spiteful or vindictive</td>
</tr>
<tr>
<td>Note: Consider a criterion met only if the behavior occurs more frequently than is typically observed in individuals of comparable age and developmental level.</td>
</tr>
<tr>
<td>B. The disturbance in behavior causes clinically significant impairment in social, academic, or occupational functioning.</td>
</tr>
<tr>
<td>C. The behaviors do not occur exclusively during the course of a Psychotic or Mood Disorder.</td>
</tr>
<tr>
<td>D. Criteria are not met for Conduct Disorder, and, if the individual is age 18 years or older, criteria are not met for Antisocial Personality Disorder.</td>
</tr>
</tbody>
</table>
Disruptive and externalizing disorders

CD, ODD and attention deficit hyperactivity disorder (ADHD) constitute together a broader category named attention-deficit and disruptive behaviour disorders in DSM-IV (APA 1994, p. 78). In some studies (e.g. Achenbach 1991, Garnefski and Diekstra 1997) the term externalizing disorders has been used to refer to both antisocial behaviour and substance misuse/dependence. Externalizing behaviours are seen as a manifestation of the same underlying construct of multiproblem behaviour sharing a range of common or similar risk factors (Donovan et al. 1988, Garnefski and Diekstra 1997, Fergusson 1998). At the adult end of the serious antisocial behaviour spectrum is antisocial personality disorder (APD) (Loeber et al. 2000a, Karnik et al. 2006). Although APD cannot be diagnosed until age 18 (APA 1994, p. 649), some of the APD symptoms (e.g. impulsivity and callousness) may already be present among antisocial adolescents. Some adolescents with severe CD will continue to behave antisocially in adulthood (Loeber et al. 2000a, Karnik et al. 2006).

2.3.2 Features of adolescent antisocial behaviour

Features of antisocial behaviour are very heterogeneous as the broad spectrum of antisocial behaviours varies widely between adolescents in form and severity. Behaviours can range from minor oppositional behaviours to more severe aggressive or non-aggressive forms of antisocial behaviour (Maughan and Rutter 2001, McMahon and Frick 2005, Nock et al. 2006). Thus, besides categorical diagnostic criteria (e.g. DSM-IV, ICD-10), antisocial behaviour can be seen as a dimensional continuum of problem behaviour in which almost all adolescents show to a greater or lesser degree (Rutter 2001). In the dimensional (or statistical) approach assessment is based on quantification of features, and antisocial behaviour is seen as a statistical deviation from normal behaviour. This approach is useful in describing a phenomenon with no clear boundaries and no explicit core symptom (APA 2000, p. xxxi, Earls and Mezzacappa 2002, Hill 2002) such as antisocial behaviour is. The categorical approach is necessary for clinical settings dividing mental disorders into types which are based on criteria with defined features. This approach, however, is problematic, as the cut-off-point is inevitably always arbitrary, and there is a risk that important differences of severity or type of dysfunction below and above the cut-off will be lost. Both

Specialization in delinquency refers to the tendency to commit the same type of crime repeatedly, whereas versatility of delinquency refers to a criminal career characterised by a random mix of offences (Kyvsgaard 2003, p. 147). Most antisocial adolescents, at least those with a severe symptom pattern, engage in many forms of antisocial behaviour (Loeber and Coie 2001). Thus specialization in one pattern of antisocial behaviour is rare (Gottfredson and Hirschi 1990, p. 91, Loeber and Stouthamer-Loeber 1998, Lahey et al. 1999a). Antisocial behaviour is usually present in different settings (e.g. at school, at home and in the community) (APA 2000, p. 94). Adolescents with repeat antisocial behaviour have been described to be as unempathetic, callous, irritable, reckless and lacking of feelings of guilt, misperceiving the intentions of others, more prone to respond with aggression than others and having poor frustration tolerance (APA 2000, p. 95). Antisocial adolescents often have a number of problems in psychosocial functioning (e.g. poor performance at school, poor social relationships, substance abuse and increased risk for suicide) which also impairs their prognosis (Loeber et al. 1998, Renaud et al. 1999, Maughan 2001, Burke et al. 2002, Deptula and Cohen 2004, McMahon and Frick 2005).

The DSM-IV (APA 1994, p. 90) divides severity levels of symptoms of CD into three subtypes: mild, moderate and severe (Table 2). Subtyping is based both on number of conduct problems and on the magnitude of harm caused to others (APA 1994, p. 87), however, number of conduct problems and the “harm to others” are not clearly specified. Besides severity of symptoms, the distinction between overt and covert behaviour has been used in subtyping antisocial behaviour (Stanger et al. 1997, Loeber and Stouthamer-Loeber 1998, Loeber et al. 2000a, Angold and Costello 2001). The overt dimension of antisocial behaviour is described as directly confrontational behaviours such as bullying, fighting and violence. In contrast, the covert dimension of antisocial behaviour consists of nonconfrontational behaviours which are, however, concealing or sneaky in nature (e.g. lying, stealing, truancy and vandalism) (Loeber and Stouthamer-Loeber 1998, McMahon and Frick 2005). These two types of problem behaviour intercorrelate significantly, and many adolescents are deviant on both of these dimensions (Stanger et al. 1997, Loeber and Coie 2001).
Adolescents with antisocial behaviour often initiate aggressive behaviour (Loeber and Stouthamer-Loeber 1998, APA 2000, p. 94). Aggression can be divided into several subtypes, of which those most often referred to are reactive and proactive aggression (Loeber et al. 2000a). In the reactive subtype, aggression is viewed as a defensive reaction to a perceived threat or provocation and is characterized by impulsiveness, anger and hostility. This subtype of aggression is common among adolescents with ODD and those with an early onset of antisocial behaviour. Proactive aggression is generally unprovoked and premeditated and it is used either for some personal gain or to coerce/dominant others. Proactive aggression is common among adolescents with CD – especially among those with delinquent behaviour (Dodge and Coie 1987, Lahey et al. 1999a, Loeber et al. 2000a, Karnik et al. 2006).

Adolescent males tend to engage in more aggressive and more serious forms of antisocial behaviour, but in milder forms sex differences tend to diminish or even disappear (Junger-Tas 1994a, Rutter et al. 1998, p. 256, Tiet et al. 2001, Kivivuori 2002b, Rey et al. 2005). Regarding offences, the male preponderance is greatest in sex and drug crimes, and crimes involving the use of force against a victim or property (Rutter et al. 1998, p. 259). Antisocial behaviour of females tends to be covert in nature while males’ antisocial behaviour tends to be more overt. In addition to this, females’ aggression is often indirect and verbal (e.g. gossiping, backbiting, peer rejection) while males’ aggression is more externally directed and physical (e.g. fighting, destructiveness) (Kann and Hanna 2000, Loeber et al. 2000a, Angold and Costello 2001, Bassarath 2001).

Features and patterns of antisocial behaviour usually change in the transition from childhood to adolescence (Loeber and Stouthamer-Loeber 1998, Loeber et al. 2000a). Typically, less serious forms of antisocial behaviour emerge first, although there are some individual differences (Loeber and Stouthamer-Loeber 1998, APA 2000, p. 97, Loeber and Coie 2001). Oppositional behaviour peaks in the early to middle childhood, and minor forms of aggression tend to peak in the early school years (Loeber and Coie 2001). With age many features of ODD decrease and behaviours typical of CD become more common during adolescent development (Junger-Tas 1994a, Simonoff et al. 1997, Lahey et al. 2000, Angold and Costello 2001). In addition, it has been reported that aggressive behaviours tend to decrease (with the exception of serious violence), while status offences and non-aggressive, covert behaviours tend to increase with age (Stanger et al. 1997, Loeber and Stouthamer-Loeber 1998, Lahey et al. 1999b, Maughan et al. 2004, Rey et al. 2005).
According to the official statistics the peak of crimes occurs around 17 to 18 years although estimates vary internationally (Rutter et al. 1998, p. 35).

2.3.3 Identifying antisocial behaviour

Since antisocial behaviour is a complex, heterogeneous disorder associated with multiple psychosocial problems, it is often recommended to assess antisocial behaviour from multidimensional perspectives. In general, the use of multiple assessments methods, multiple informants (adolescent, parents, teacher and other significant persons close to the adolescent) and assessment in multiple settings (home, school and community) is recommended to obtain a comprehensive view of an adolescent’s behaviour. The use of multiple informants is advisable because different informants evaluate adolescents’ behaviour from different perspectives and in different reference groups. Moreover, adolescents tend to behave differently in different settings (AACAP 1997, Reitman et al. 1998, Kann and Hanna 2000, McMahon and Frick 2005). However, as in the case of depression (Chapter 2.2.4.1), there is no clear consensus on how to combine information from different informants (Reitman et al. 1998, Roberts et al. 1998). Besides this, adolescents are seen as important informants because their parents are not always aware of adolescents’ behaviour, the covert behaviour and antisocial behaviour of older adolescents especially may be kept in the dark (Rutter et al. 1998, p.40, Lahey et al. 2000, Romano et al. 2001). On the other hand, some antisocial adolescents tend to minimize their behaviour (AACAP 1997), but especially if information is gathered anonymously, the reliability of assessment has been deemed good (Kivivuori 2005a).

Antisocial behaviour can be assessed through diagnostic interviews, behaviour rating scales, crime statistics and observations (Reitman et al. 1998, Rutter et al. 1998, Kann and Hanna 2000, McMahon and Frick 2005). Diagnostic interviews can be divided by the level of structure or standardization into unstructured, semi-structured and structured interviews; of these semi-unstructured and structured diagnostic interviews are commonly used in research settings. Diagnostic interviews on antisocial behaviour have similar advantages and are hampered by limitations similar to those in interviews on depression (see Chapter 2.2.3).
Behaviour rating scales can be completed by adolescents, parent(s) and teachers and/or other significant persons close to the adolescent or they can be formulated into interview questions. They are regarded as a useful method in screening for a broad range of antisocial behaviours as they usually consist of a standard list of specified antisocial behaviours reflecting the number of diverse acts the respondent has committed and/or the frequency of antisocial behaviour in a specified period (Reitman et al. 1998, Bendixen et al. 2003, Kivivuori 2005a). Rating scales usually assess common and victimless forms of antisocial behaviour, because it is not meaningful to inquire about extremely serious acts as a respondent has greater reason to deny them (Rutter et al. 1998, p. 40, Kivivuori 2005a). The use of rating scales enables comparisons between an adolescent’s level of antisocial behaviour and a reference group of the same age and gender. On the other hand, rating scales are usually seen as unequal to diagnostic interviews (Kann and Hanna 2000, McMahon and Frick 2005, Mojtabai 2006) although there is some evidence that the differences in reliability and validity are small between these instruments (Boyle et al. 1997). In addition, although there are known limitations to the reliability of self-reported antisocial behaviour (e.g. dishonesty, forgetfulness and exaggeration), they are generally considered reliable and valid methods in adolescence (Junger-Tas 1994b, Kivivuori 2005a). The most used rating scales of antisocial behaviour include YSR (the Youth Self-Report), CBCL (the Child Behavior Checklist), the Eyberg Child Behavior Inventory, SRD (the Self-Report Delinquency Scale), SDQ (the Strengths and Difficulties Questionnaire) (Reitman et al. 1998, Goodman 2001, McMahon and Frick 2005).

Crime statistics can also be used in assessing antisocial behaviour, but their disadvantage is that only a minority of delinquent adolescents is caught by the police and thus the majority does not appear in official crime statistics (Moffitt 1993, Rutter et al. 1998, p. 35, Kivivuori 2005a). In a Finnish study Kivivuori (2002a) found that only 11% of adolescents reporting shoplifting or violence were caught by the police. Of course, there are differences between types of offence as lethal crimes etc. serious crimes are most likely to be included in official crime statistics (Kivivuori 2005a). In addition, not all crimes are included in official statistics if committed by adolescents under the age of criminal responsibility. Moreover, international comparisons and interpretations of official statistics are difficult because the age of criminal responsibilities and legal categories of crimes between countries differ significantly (Junger-Tas 1994b, Rutter et al. 1998, p.26).

Behavioural observations can be conducted either in an adolescent’s natural setting (e.g. school, home, peer group) or in clinics or laboratories. Observations can provide useful information about an adolescent’s behaviour which is not filtered through the perceptions of an informant, but on the
other hand they are extremely time-consuming and expensive. In addition, covert behaviours (e.g. theft) are quite impossible to identify reliably through observation. Among the most used observation paradigms are the Parent Daily Report and the Direct Observation Form (DOF) (Reitman et al. 1998, McMahon and Frick 2005).

2.3.4 Epidemiology of adolescent antisocial behaviour

2.3.4.1 Methodological issues in epidemiological studies on adolescent antisocial behaviour

Epidemiological studies have previously reported widely varying prevalence rates of antisocial behaviour. Factors similar to those in the case of depression (see Chapter 2.2.4.1) contribute to the wide variability in rates (Roberts et al. 1998).

In community studies on antisocial behaviour sample size has ranged widely from a few hundreds to several thousands (Fergusson et al. 1993, Lewinsohn et al. 1993, Wichstrom et al. 1996, Kratzer and Hodgins 1997, Verhulst et al. 1997, Weist et al. 1998, Ford et al. 2003, Heyerdahl et al. 2004, Maughan et al. 2004, Little and Garber 2005). In general, sample sizes are larger in studies based on rating scales than in interview based studies. Many studies (especially interview based studies) have used random sampling (e.g. Lewinsohn et al. 1993, Romano et al. 2001, Gau et al. 2005, Rey et al. 2005), which increases the representativeness of the samples. As in the case of depression (see Chapter 2.2.4.1), age distribution is a significant factor for representatives (Roberts et al. 1998) because the occurrence and features of antisocial behaviour change with adolescent development (Junger-Tas 1994a, Angold and Costello 2001). Similarly, it is essential to consider the gender distribution of the sample. Although a substantial number of studies (e.g. Lahey et al. 1999a, Pedersen et al. 2001, Tiet et al. 2001) have demonstrated that antisocial behaviour is more prevalent among males than females, it is important to consider whether different symptom presentations between sexes might as least partly explain the found differences (Angold and Costello 2001). Given that e.g. DSM-IV based interviews are mostly based on items that are more common among males (e.g. physical aggression), it is quite possible that the main items of females’ antisocial behaviour are not captured in the interview and are therefore not identified (Kann and Hanna 2000, Loeber et al. 2000a). In addition, the gender ratio depends on the age group studied, as males tend
to predominate in childhood but as children grow up, the gap between males and females diminishes (AACAP 1997, Maughan et al. 2004). Most studies so far have been conducted among males (AACAP 1997, Keenan et al. 1999, Hill 2002). Regarding school-based samples, estimates of antisocial behaviour may be underestimated since school non-attenders are omitted (Junger-Tas 1994b). Finally, there seems to be large cross-national and cultural variation in the prevalence and the features of antisocial behaviour. For example, it has been reported that in the United States crimes involving weapons are approximately 15 times more common than in Europe, and lethal violence occurs in the context of another crime much more often in the United States than in Europe (Rutter et al. 1998, p. 40, Savolainen et al. 2000). Most of the existing studies have been conducted in the United States or in the UK.

In earlier studies, the most used data collection methods have been (semi)structured interview schedules and self-report rating scales. Especially regarding rating scales, there is wide variation between scales in the items used as they vary from minor to serious forms of antisocial behaviour. Similarly, the number of items varies notably between scales. As a heterogeneous disorder, there is no core group of features of antisocial behaviour, and therefore rates of antisocial behaviour depend entirely upon which symptoms are included in the instrument (Angold and Costello 2001). It is noteworthy that there have been major changes in DSM criteria for CD and ODD since 1980 (Angold and Costello 2001) which may produce significant changes in estimates (Loeber et al. 2000a). Based on different informants prevalence rates of antisocial behaviour may vary greatly (e.g. Verhulst et al. 1997, Romano et al. 2001), but in general, at least among older adolescents, the prevalence rate is higher according to the adolescent than parental report (Romano et al. 2001). As there is uncertainty regarding how to best combine information from multiple informants, it is recommended to report rates separately by informant (Roberts et al. 1998).

2.3.4.2 Prevalence and incidence of adolescent antisocial behaviour

Antisocial behaviour is one of the most common mental disorders among children and adolescents. It has been estimated that in general population 5 to 10% of the children and adolescents (aged 8 to 16 years) have notable behaviour problems in the spectrum of antisocial behaviour (Angold and Costello 2001). According to interview based studies in community based adolescent samples
lifetime prevalence of CD has ranged from 1.7% to 11.2% (Lewinsohn et al. 1993, Nock et al. 2006), 6-month prevalence from 0.6% to 6.0% (Verhulst et al. 1997, Romano et al. 2001), 3-month prevalence from 1.6% to 9.0% (Simonoff et al. 1997, Costello et al. 2003, Gau et al. 2005) and current prevalence rate from 0.3% to 3.3% (Lewinsohn et al. 1993, Ford et al. 2003). Dick et al. (2005) reported that 15% of 14-year-old boys and 8% of the same aged girls had a lifetime diagnosis of CD in a Finnish sample. Ristikari et al. (2006) reported in a Finnish sample that 2.6% of 18-year-old boys had an APD diagnosis according to their military clinical records.

According to rating scales estimates of antisocial behaviour in community samples have ranged from 0.8% to 42.5% in 12-month prevalence (Wichstrom et al. 1996, Vermeiren et al. 2002a, Heyerdahl et al. 2004) and from 5.3 to 18.2% in 6-month prevalence (Weist et al. 1998, Heyerdahl et al. 2004, Little and Garber 2005, Lien et al. 2006, Mojtabai 2006). According to recent Finnish studies estimates of antisocial behaviour have ranged between 12.9 and 29.4% among 14- to 16-year-old adolescents (Laukkanen et al. 2002, Kaltiala-Heino et al. 2003). Frequent involvement in bullying at school has been reported by 9% of the Finnish boys and 2% of the girls (Kaltiala-Heino et al. 2000).

According to an international survey conducted in thirteen western countries 16% to 34% of adolescents had committed at least one property offence during the past year, 16% to 35% of them had used violence at least once and 11% to 26% of them had used drugs at least once (Junger-Tas 1994a). Corresponding rates were reported by a Finnish survey conducted among 15 to 16 year-olds (Kivivuori 2005b). In 2007, 17% of Finnish adolescents aged 14 to 16 years reported that they had frequently been involved in delinquency during the past year (http://info.stakes.fi/kouluterveysyksele). Pelkonen et al. (2003) reported that 7.3% of 16-year-old boys and 2.0% of same-aged girls had broken the law with consequences during the past year.

Reportedly, antisocial behaviour by children/adolescents has increased remarkably in developed countries in recent decades (Smith 1995, Fombonne 1998, Costello et al. 2006). However, evidence from recent Finnish epidemiological studies suggests no significant increase in the prevalence of antisocial behaviour. In fact, results from the School Health Promotion Study 2007 indicate that in the period 2002 – 2007 frequent delinquency decreased from 21% to 17% among 14 to 16 year-old
adolescents (http://info.stakes.fi/kouluterveyskysely). Corresponding results have also been reported by the National Research Institute of Legal Policy (Kivivuori 2005b).

In general, both in childhood and adolescence males are more likely than females to engage in antisocial behaviour (Junger-Tas 1994a, Rutter et al. 1998, p. 254, Lahey et al. 1999b, Silverthorn and Frick 1999). More precisely, males are two to five times more likely to merit a diagnosis of CD than females (Rutter et al. 1998, p. 263, Loeber et al. 2000a), but in other forms of antisocial behaviour the sex ratio varies. This is mainly because symptom presentation of antisocial behaviour differs between genders as discussed in Chapter 2.3.2. For instance, there seems to be very little gender difference in rates of ODD in adolescence (Simonoff et al. 1997, Lahey et al. 2000, West et al. 2003, Rowe et al. 2006), but regarding official crime statistics the male preponderance is at least 4:1 (Rutter et al. 1998, p. 259). In general, the more serious the offence, the greater is the difference between genders (Junger-Tas 1994a), but the gender difference seems to narrow in adolescence as more females engage in antisocial behaviour (Silverthorn and Frick 1999). Interestingly, the overall gender ratio for antisocial behaviour has decreased notably in the past 40 years (Fombonne 1998, Rutter et al. 1998, p.254, Keenan et al. 1999). The underlying mechanisms for the predominance of antisocial males is still unclear, and further study e.g. on differences in the risk factors of antisocial behaviour between genders is needed (Lahey et al. 1999b, Silverthorn and Frick 1999).

In general, antisocial behaviour increases with age (e.g. Simonoff et al. 1997, Garnefski 2000, Gomes et al. 2003), but age trends differ for aggressive and non-aggressive behaviour (Lahey et al. 1999b) as discussed in Chapter 2.3.2. Most of the age-related increase is the result of worsening behaviour in adolescents with early age at onset, and because of the increase in non-aggressive behaviours (Lahey et al. 1999b). Delinquency peaks in middle adolescence after which it steadily declines into young adulthood (Loeber et al. 1998, p. 75, Rutter et al. 1998, p.35, Overbeek et al. 2001) in spite of some variations between offences (Junger-Tas 1994a, Kivivuori 2005a). Vandalism is most prevalent among 14 to 15 year-olds, property offences among 16 to 17 year-olds and serious violence reaches its peak among 18 to 20 year-olds (Junger-Tas 1994a). Most studies have found that male predominance in antisocial behaviour increases steadily with age, while in females rates remain low until early adolescence (Silverthorn and Frick 1999, Maughan et al. 2004).

Given that features and patterns of antisocial behaviour change in the transition from childhood to adolescence (Loeber and Stouthamer-Loeber 1998, Loeber et al. 2000a, Loeber and Coie 2001), the
age-at-onset of different types of antisocial behaviour also varies. Females usually start somewhat later than males (Junger-Tas 1994a). In a community sample of males in the Pittsburgh Youth Study minor to moderate antisocial behaviour (e.g. minor vandalism or theft) started at age 5 to 6 and accelerated between ages 10 and 12, whereas serious forms of antisocial behaviour (e.g. car theft or serious violence) started at aged 6 to 7, and accelerated between ages 11 to 12 (Loeber et al. 1998, p.75). In a community sample of males and females Lahey et al. (1999a) found, however, notably higher age-at-onset of the first conduct problems as mean age at onset varied between ages 10 and 11 depending on the informant. The age-at-onset for CD has varied widely between 4.5 and 11.6 years (Rowe et al. 2002, Nock et al. 2006).

2.3.5 Development, course and consequences of adolescent antisocial behaviour

2.3.5.1 Etiology of adolescent antisocial behaviour

Antisocial behaviour is a multietiological disorder in which many genetic, biological, psychological, psychosocial, psychopathological and sociodemographic risk factors overlap and interact (Rutter et al. 1998, Waddell et al. 1999, Burke et al. 2002, Ritakallio et al. 2003, McMahon and Frick 2005). As most studies have mainly been based on males, it is doubtful whether these findings can be applied to the females, given possible differences in patterns of risk factors (Lewin et al. 1999, Aalsma and Lapsley 2001, Storvoll and Wichstrom 2002) and differences in the clinical features between sexes (Kann and Hanna 2000, Bassarath 2001). In addition to this, there is some evidence that different risk factors may be associated with early onset (individual and family factors) and later onset (psychosocial and environmental factors) of antisocial behaviour (Moffitt 1993, Lahey et al. 1998, McCabe et al. 2001, Moffitt and Caspi 2001, Taylor et al. 2002). Similarly, there may be differences in the etiology of different types of antisocial behaviour (McMahon and Frick 2005). Finally, most risk factors/correlates seem to be non-specific to antisocial behaviour (Angold and Costello 2001, Maughan 2001).
Genetic factors

Several studies have reported that antisocial behaviour is a familial disorder as it has been shown to aggregate in families, paternal antisocial behaviour especially seems to predict offspring’s antisocial behaviour. Molecular genetic studies on antisocial behaviour are sparse, and the results are only preliminary. According to twin and adoption studies there may be some evidence of genetic liability for antisocial behaviour (although the results are not consistent), but because of difficulties in differentiating between genetic factors and environmental risk factors associated with familial antisocial behaviour solid conclusions are difficult to draw. In fact, at present it seems that genetic and other risk factors combined are most predictive of development of antisocial behaviour. Some evidence exists that genetic factors may be more predictive for antisocial behaviour persisting into adult life than for behaviour which is restricted to childhood and adolescence. However, more research on the nature-nurture interplay is needed (Rutter et al. 1998, Simonoff 2001, Burke et al. 2002, Karnik et al. 2006).

Biological factors

Some neural mechanisms seem to be associated with aggressive behaviour, but the findings are inconsistent and further investigations are needed (Rutter et al. 1998, Burke et al. 2002, McMahon and Frick 2005). Regarding neurochemicals, although many of them (e.g. noradrenaline, dopamine, testosterone and cortisol) appear to be involved in aggressive behaviour, the serotonergic system has been studied most and seems to play a decisive role. As in depression, several studies have reported that diminished serotonergic function is associated with both concurrent and future aggression and especially with impulsive aggression. An association has been observed only between aggression and serotonin, currently there is no evidence of the same association with nonaggressive antisocial behaviour (Herbert and Martinez 2001, Burke et al. 2002). Neuroanatomical studies have revealed that decreased metabolism of the frontal lobe and frontal lobe damage are associated with aggression (Burke et al. 2002). Some prenatal problems (e.g. maternal smoking) and birth complications especially combined with other factors (e.g. maternal rejection) seem to increase the risk of antisocial behaviour (Raine et al. 1994, Fergusson et al. 1998, Hill 2001, Burke et al. 2002).
**Psychological factors**

Children/adolescents with antisocial behaviour have been described to be impulsive, have difficult temperament and be keen to seek excitement and risky behaviours. They are often described to have negative emotionality, to use an aggressive style of coping, lack a sense of responsibility and to often lack self-control. Deficits in social skills and social-information processing (hostile attributional biases) are strongly associated with risk of antisocial behaviour (Moffitt 1993, Tremblay et al. 1994, Kingston and Prior 1995, AACAP 1997, Rutter et al. 1998, Keltikangas-Järvinen 2001, Dodge and Pettit 2003, Karnik et al. 2006). Several neuropsychological defects are also associated with antisocial behaviour, such as impaired verbal ability and executive dysfunction (e.g. defects in abstract reasoning, concept formation, formulating goals, programming behaviour and sustaining concentration) (Lynam and Henry 2001). Antisocial adolescents often hold positive attitudes to aggression and consider own aggressive behaviour justified (Rutter et al. 1998).

**Psychosocial factors**

School problems, poor scholastic achievement and learning difficulties are psychosocial stressors which are associated with increased antisocial behaviour (Loeber et al. 1998, p.109, Lewin et al. 1999, Loeber et al. 2001, Grigorenko 2006, Karnik et al. 2006). Early puberty (Graber et al. 1997, Kaltiala-Heino et al. 2003) and negative life events (Bru et al. 2001) are also associated with antisocial behaviour. Exposure to community violence, either as a victim or as a witness of violence has been found to increase the risk of antisocial behaviour (Song et al. 1998, Molnar et al. 2005). Involvement with antisocial peers strongly predicts and reinforces adolescents’ own antisocial behaviour (Brendgen et al. 2000, McCabe et al. 2001, Deptula and Cohen 2004, McMahon and Frick 2005). Peer rejection and lack of social support from peers are associated with antisocial behaviour (Lewin et al. 1999, Bru et al. 2001). Antisocial adolescents usually have as many friends as others, but they report having fewer close and supportive friends, and these relationships tend to be unstable and conflictual (Deptula and Cohen 2004).

Antisocially behaving children and adolescents often live in families in which internal conflicts and poor family functioning, domestic violence, inconsistent parenting or punitive discipline, insufficient monitoring or distant child-parent relationship and lack of social support are typical (Wasserman et al. 1996, Rutter et al. 1998, Rey et al. 2000, Bru et al. 2001, Loeber et al. 2001,
Loukas et al. 2001, Burke et al. 2002). Familiar criminality and psychopathology, especially paternal antisocial personality disorder, is associated with increased risk of antisocial behaviour (Loeber et al. 1995, Stranger et al. 1999, Farrington et al. 2001, Loeber et al. 2001). In addition, antisocial adolescents often grow up in divorced or single-parent families (Koskinen et al. 2001), but the risk effect of divorce seems to be mediated through impaired quality of parenting by the custodial parent and through non-involvement of the non-residential parent rather than by divorce per se (Simons et al. 1999).

**Psychopathology**

A number of studies have reported that early aggression, oppositional behaviour and hyperactivity problems are significant factors for subsequent antisocial behaviour. Shyness and social isolation, especially in combination with aggression, predicts later antisocial behaviour (Moffitt 1993, AACAP 1997, Rutter et al. 1998, Lahey et al. 1999b, Sourander et al. 2006). Substance abuse and dependence are strongly associated with antisocial behaviour (Rutter et al. 1998, Bassarath 2001). In addition, traumas leading to posttraumatic stress disorder are common among adolescents with antisocial behaviour (Karnik et al. 2006).

**Sociodemographic factors**

Reportedly, low SES, low parental education, poor housing, poor and disordered schools and disadvantaged neighbourhoods have also been associated with increased risk of antisocial behaviour (Lahey et al. 1999b, Loeber et al. 2001, Dodge and Pettit 2003, Hurtig et al. 2005, Sourander et al. 2006).

**2.3.5.2 Models on the development of adolescent antisocial behaviour**

Criminological studies have revealed that a small minority of adolescents (approximately 3-6%, mostly males) are responsible for the majority of the known crimes in this age group (Rutter et al. 1998). Although some of these severely antisocially behaving adolescents tend to continue
behaving antisocially in adulthood, there is, however, convincing evidence that the majority of antisocial adolescents desists in antisocial behaviour over time (Pulkkinen 1988, Moffit 1993, Smith 1995, Loeber and Hay 1997). A large number of studies and theories have tried to determine whether persistent, severely antisocial adolescents represent a specific type of antisocial behaviours, and whether these adolescents differ from others regarding risk factors and developmental trajectories (Rutter et al. 1998, Loeber and Farrington 2000, Aalsma and Lapsley 2001, Hill 2002, McMahon and Frick 2005). The theories most often referred to are Moffitt’s model on developmental taxonomy (e.g. 1993, 1996, 2001, 2002) and Loeber’s and co-workers’ model of three developmental pathways in antisocial behaviour (e.g. 1997, 1998, 2000, 2002).

Moffitt’s development taxonomy model

The key feature of the original Moffitt’s development taxonomy model (1993) is a division of antisocial adolescents into two separate groups according to the onset of antisocial behaviour: those with early onset (life-course persistent group, LCP) and those with adolescent onset of antisocial behaviour (adolescent limited group, AL). Among LCP adolescents antisocial behaviour often starts at pre-school age with oppositional and defiant behaviour, after which symptoms increase steadily over time and finally escalate in severe antisocial behaviour during adolescence (Moffitt 1993, Moffitt et al. 1996). LCP is associated with high rates of neuropsychological deficits (e.g. ADHD, low IQ) which are seen as the primary basis of antisocial behaviour in interaction with other early difficulties (e.g. difficult temperament, impulsivity and peer difficulties) and adverse family environments (e.g. poor parenting) (Moffitt 1993, Moffitt et al. 1996). In addition, comorbid mental health problems are more prevalent and severe in the LCP group than in the AL group (Vermeiren 2003). LCP is more common among males than females as the sex ratio has been estimated to be as high as 10:1 (Lahey et al. 1998, Moffitt and Caspi 2001). Some of these adolescents in the LCP group continue to behave antisocially in adulthood and are later diagnosed as having antisocial personality disorder (Hill 2002, Karnik et al. 2006).

In contrast to the stable continuity in the LCP group, discontinuity is a key feature of antisocial behaviour among adolescents in the AL group. In this group antisocial behaviour begins during adolescence and is usually restricted to this period. Associating with antisocial peers, seeking adult privileges and experience of a temporal maturity gap are seen as the primary basis of antisocial
behaviour in the AL group. A maturity gap is described as the long gap between biological and social maturity (i.e. adult status). Adolescents in the AL group engage in antisocial behaviour to gain adult privileges and imitate peers in LCP groups who appear to have achieved autonomy from parents. As AL adolescents do not usually have a long history of neuropsychological deficits or antisocial behaviour, they have better psychosocial capacities, low rates of overt aggression and therefore better adult outcomes than LCP adolescents. Most AL adolescents desists antisocial behaviour in young adulthood, when prosocial behaviour becomes more rewarding and autonomy is reached otherwise (Moffitt 1993, Moffitt et al. 1996, Moffitt and Caspi 2001). There are no remarkable sex differences in the AL group as the sex ratio is close at 1:1 (Lahey et al. 1998, Moffitt and Caspi 2001, Storvoll and Wichstrom 2003).

There is substantial evidence that early emerging versus later emerging antisocial behaviour differ both quantitatively and qualitatively (Lahey et al. 1998, Lahey et al. 1999a, McCabe et al. 2001). Antisocial behaviour in those with early onset is described as more frequent, stable, severe, versatile and aggressive than in those with later onset of antisocial behaviour. In addition, age at onset is inversely associated with psychosocial impairment, mental health service use and rates of ODD/CD (Moffitt 1993, Moffitt et al. 1996, Lahey et al. 1999a). Moffitt et al. (1996) reported that most antisocially behaving adolescents are in the AL group (24%) as LCP adolescents constitute only a small subgroup (7%) of all antisocially behaving adolescents.

Loeber’s model of three developmental pathways

The model by Loeber and co-workers (e.g. 1997, 1998, 2000, 2002) of three developmental pathways in antisocial behaviour was developed in the longitudinal sample of the Pittsburgh Youth Study, and has been replicated in several other studies (e.g. Loeber et al. 1997, Stouthamer-Loeber and Loeber 2002). However, as the model was developed among males, it is unclear whether these pathways can be generalized to females (Storvoll and Wichstrom 2003). The model hypothesized that different manifestations of antisocial behaviours at different severity levels are manifestations of the same underlying deviancy, and that males differ in the extent which they escalate over time into serious antisocial behaviour (Loeber and Farrington 2000, Stouthamer-Loeber and Loeber 2002). This model consists of three pathways for different behaviour patterns (an overt pathway, a covert pathway and an authority conflict pathway) and orderly sequencing steps which describe both the increasing severity of behaviour and the decreasing number of adolescent involved.
Adolescents may progress along one or multiple pathways towards serious antisocial behaviour (Loeber et al. 1997, Stouthamer-Loeber and Loeber 2002). “An overt pathway” starts with minor aggression (e.g. bullying or annoying others) which gradually proceeds to physical fighting and finally escalates with more serious forms of violence (e.g. rape or attack). “A covert pathway” starts before age 15 years with minor covert behaviours at the first stage (e.g. lying or shoplifting), followed by property damage at the second stage (e.g. vandalism or fire setting) and finally results in moderate to serious delinquency at the third stage (e.g. burglary or fraud). “An authority conflict pathway” starts before age 12 years first as stubborn behaviour and defiance, and finally ending with authority avoidance of e.g. parents and teachers (e.g. truancy, running away) (Loeber and Farrington 2000). Only a minority of males will develop progressively to the most serious level within pathways; these males are likely to be those with early onset and persistent and severe manifestation of antisocial behaviour. Most disturbed males manifest antisocially in multiple pathways. Desistance of antisocial behaviour is inversely associated with serious antisocial acts, hard drug use, gang membership and positive attitude to antisocial behaviour. Being at work/school attendance and low physical punishment is also associated with desistance (Loeber and Farrington 2000, Stouthamer-Loeber and Loeber 2002, Stouthamer-Loeber et al. 2004).

The main difference between Moffitt’s and Loeber’s models is whether they focus on heterogeneity, by defining the age at onset of antisocial behaviour, or identifying specific patterns or features of antisocial behaviours (Hill 2002). Nevertheless, it is evident that there are multiple developmental pathways to antisocial behaviour, all characterised by different causal processes and manifestations of antisocial behaviour.

2.3.5.3 Course and consequences of adolescent antisocial behaviour

Numerous studies have established that antisocial behaviour has considerable continuity both in adolescence (Fergusson et al. 1996, Loeber et al. 2000b, Cote et al. 2001, Beyers and Loeber 2003, Kim et al. 2003, Marmorstein and Iacono 2003, Wiesner 2003) and in adulthood (Ferdinand et al. 1995, Satterfield and Schell 1997, Pullkainen et al. 2000, Simonoff et al. 2004). Costello et al. (2003) found that adolescents with a history of antisocial behaviour were ten times more likely than those with no history of antisocial behaviour to behave antisocially in the future. In a longitudinal
study by Satterfield and Schell (1997), 35 % of males with comorbid hyperactivity and childhood antisocial behaviour engaged in multiple delinquent acts during adolescence, and 70% of them continued offending in adulthood. Those adolescents especially with an early onset of antisocial behaviour and those with severe, aggressive antisocial symptoms accompanied by a range of psychosocial problems are most likely to continue to behave antisocially in later adolescence and in adulthood (Moffitt 1993, Rutter et al. 1998, p. 98, Loeber et al. 2000a, Cote et al. 2001, Maughan and Rutter 2001). This is likely because, due to years of involvement in severe antisocial behaviour, adolescents miss opportunities to adapt and practise prosocial behaviours and are likely to make irrevocable future decisions (Moffitt 1993, Loeber and Farrington 2000, Taylor et al. 2002, Fergusson et al. 2005). However, adolescents with later onset of antisocial behaviour may not be totally without problems in adulthood as they have been reported to have more mental disorders and more self-reported offending than those without any history of antisocial behaviour (Moffitt et al. 2002).


In adulthood, prior antisocial behaviour is associated with increased rates of psychiatric disorders, substance abuse and premature mortality (Kratzer and Hodgins 1997, Pajer 1998, Rutter et al. 1998, Laub and Vaillant 2000, Hofstra et al. 2002, Kim-Cohen et al. 2003). In a longitudinal study by Kim-Cohen et al. (2003) for all adult mental disorders at age 26 years, as many as 25% to 60% of cases had a history of childhood antisocial behaviour. As adults, antisocial adolescents often

Although the results are somehow inconsistent (Ferdinand et al. 1995, Costello et al. 2003, Storvoll and Wichstrom 2003), it has been reported that the continuity of severe antisocial behaviour is higher among females than males (Loeber et al. 2000a). It has also been reported that antisocial females may be at greater risk of multiple problems and consequences than males (Loeber and Keenan 1994, Loeber and Loeber-Stouthamer 1998, Tiet et al. 2001). This notion is usually referred to as the gender paradox, that is the gender with lower prevalence of disorder is actually at higher risk of poor outcome (Tiet et al. 2001).

2.3.6 Comorbidity in adolescent antisocial behaviour

Comorbidity among antisocially behaving adolescents seems to be the rule rather than the exception. Comorbidity seems to be more common among antisocial females than males (Keenan et al. 1999, Kann and Hanna 2000). The most common comorbid disorders with antisocial behaviour are substance abuse or dependence (11 - 50 %), mood and anxiety disorders (5 - 45 % each) and ADHD (43-93%) (Jensen et al. 1997, Angold et al. 1999, Costello et al. 1999, Renaud et al. 1999). Antisocial adolescents also have elevated rates of suicidal behaviour (5 - 46%) even without concurrent depression (Apter et al. 1995, AACAP 1997, Angold et al. 1999, Loeber et al. 2000a, King et al. 2001, Pelkonen and Marttunen 2003). The majority of studies have found most comorbid disorders to be secondary to antisocial behaviour with the possible exception of ADHD, which begins in early childhood (AACAP 1997, Costello et al. 1999, Loeber et al. 2000a, Angold and Costello 2001, McMahon and Frick 2005).

Comorbidity between depression and antisocial behaviour will be discussed in detail in Chapter 2.4.
2.4 Comorbidity between depression and antisocial behaviour in adolescence

2.4.1 Features of comorbid depression and antisocial behaviour in adolescence

Given that the core symptoms of depression and antisocial behaviour differ notably, the strong co-occurrence of these disorders may be rather surprising (Wolff and Ollendick 2006). On the other hand, irritability is a frequent symptom both among depressed and antisocially behaving adolescents (Herkov and Myers 1996, Weisbrot and Ettinger 2002). Thus, numerous studies, especially in clinical (e.g. Biederman et al. 1995, Grilo et al. 1996, Herkov and Myers 1996, Karlsson et al. 2006b) and delinquent samples (e.g. Duclos et al. 1998, Ulzen and Hamilton 1998, Teplin et al. 2002) have reported high comorbidity between adolescent depression and antisocial behaviour. However, whether the symptom profiles of combination of depression and antisocial behaviour differ from pure depression and/or from pure antisocial behaviour has been studied less.

Reportedly, comorbid depression with antisocial behaviour may be a distinct disorder from both pure depression and pure antisocial behaviour based on a different etiology (Birmaher et al. 1996, Parker and Roy 2001, Simic and Fombonne 2001). Adolescents with a combination of depression and antisocial behaviour have been reported to witness more family violence, experience more poor parenting, hostility and physical abuse than those with pure depression (Meller and Borchardt 1996, Simic and Fombonne 2001), and to have more often a history of physical abuse and events resulting in loss of self-esteem than those exhibiting pure antisocial behaviour (Simic and Fombonne 2001).

A combination of depression and antisocial behaviour has been reported to be associated with earlier onset of depression, longer duration of disorders, increased rates of irritability and police contacts, increased suicidality, lower social competence and decreased rates of anxiety (Capaldi 1991, Harrington et al. 1991, Capaldi 1992, Lewinsohn et al. 1994, Lewinsohn et al. 1995a, Meller and Borchardt 1996, Renouf et al. 1997, Simic and Fombonne 2001). In clinical samples adolescents with comorbid depression and antisocial behaviour have been reported to evince more atypical symptoms of depression such as high energy, inflated sense of self, optimism, lack of social anxiety, less insomnia, less guilt, fewer ruminations and lower overall severity of depressive symptoms than adolescents with pure depression (Herkov and Myers 1996, Simic and Fombonne 2001).
Further, antisocially behaving adolescents with comorbid depression have been reported to be less likely to steal, to be less destructive, to be less overtly aggressive and to have overall fewer symptoms of antisocial behaviour than those adolescents with pure antisocial behaviour (Simic and Fombonne 2001). Although not consistently reported (Haapasalo and Hämäläinen 1996, Arseneault et al. 2000), there is also some evidence that depression is more frequent among aggressive than among non-aggressive delinquents (Rey et al. 2005). In addition, some evidence exists that the timing of comorbidity affects the profile of antisocial behaviour, as Loeber et al. (1994) found that early adolescent males with comorbidity tend to show overt and covert behaviour whereas in later adolescence comorbid adolescents had more conflicts with authority. In light of these results, some authors (e.g. Simic and Fombonne 2001) have proposed that comorbidity between depression and conduct disorder also merits separate diagnostic criteria in DSM-IV, as has been done in ICD-10. However, not all studies have found differences between features of pure disorders and comorbid disorders (Ezpleta et al. 2005) or in the profile of delinquency according to depression (Elonheimo et al. 2007).

2.4.2 Epidemiology of comorbid depression and antisocial behaviour in adolescence

Earlier studies have reported widely varying rates of comorbidity between adolescent depression and antisocial behaviour. Most of these studies have been conducted in sentenced/incarcerated samples (e.g. Timmons-Mitchell et al. 1997, Duclos et al. 1998, Ulzen and Hamilton 1998, Pliszka et al. 2000, Vermeiren et al. 2000) or in clinical populations (e.g. Mitchell et al. 1988, Grilo et al. 1996, Greene et al. 2002). In clinical samples the rates of comorbidity between depression and antisocial behaviour have ranged between 15% and 72% (Kovacs et al. 1988, Harrington et al. 1991, Grilo et al. 1996, Greene et al. 2002). In a Finnish outpatient sample 25% of the depressed boys and 7% of the depressed girls were diagnosed to have comorbid disruptive disorder (Karlsson et al. 2006b). According to the review by Vermeiren (2003) prevalence rates of depression have ranged between 11% and 33% in institutionalized delinquent samples, while up to 50% of delinquent adolescents have been reported to have less severe depressive symptoms. Sailas et al. (2005) reported that 3.5% [odds ratio (OR) 4.3 and 5.8] of the young prisoners in Finland had had at least one inpatient treatment episode for depression in the past year. Both of these research frames have some limitations in their generalizability as clinical samples are hampered by the fact that comorbid adolescents are much more likely to receive
treatment than adolescents with only one disorder (Angold et al. 1999, Rowe et al. 2002). Regarding delinquent samples, the fact that rates of depression may be biased due to the consequences of incarceration cannot be overlooked. Some studies have found that being caught accompanied by the feelings of shame and guilt as well as separation from family causes depression or at least exacerbates it, as others have suggested that depression is associated with the severity and frequency of antisocial behaviour (Kashani et al. 1980, Vermeiren et al. 2002a, Gomes et al. 2003).

Studies on comorbidity between depression and antisocial behaviour conducted in community samples give a more extensive picture of antisocial behaviour than studies conducted in delinquent samples based on official crime statistics (Kaltiala-Heino et al. 2006). In a review of 16 epidemiological studies Angold et al. (1999) found a median OR of 6.6 (95% CI 4.4-11.0) for comorbidity between depression and conduct disorder among children and adolescents. In pure adolescent general populations, OR for the comorbidity between depression and antisocial behaviour ranged from 1.7 to 7.0, and rates of comorbidity have ranged from 6.2% to 45% (Table 4). In Finland, estimates of comorbidity have ranged from 6.2% to 37.2% depending on the definition of antisocial behaviour used (Kaltiala-Heino et al. 2000, Kaltiala-Heino et al. 2003, Pelkonen et al. 2003, Sihvola et al. 2007). Studies focusing especially on the association between delinquent behaviour and depression in a general adolescent population are rare (Vermeiren et al. 2002a).
Table 4. Comorbidity between depression and antisocial behaviour in a community based child-adolescent samples.

<table>
<thead>
<tr>
<th>Reference</th>
<th>N; gender</th>
<th>Study population</th>
<th>Age (years)</th>
<th>Assessment method; source of information</th>
<th>Definition of depression</th>
<th>Definition of antisocial behaviour</th>
<th>Timeframe of comorbidity</th>
<th>Rates of comorbidity (%)</th>
<th>OR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capaldi 1991</td>
<td>203; m</td>
<td>At-risk school sample</td>
<td>Grade 6</td>
<td>Interviews and questionnaires; adolescent, parents, teachers, observers</td>
<td>Depressive symptoms</td>
<td>Conduct problems</td>
<td>Not reported</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>Lewinsohn et al. 1991 and Rohde et al. 1991</td>
<td>1,710; m and f</td>
<td>Random school sample</td>
<td>14 - 18</td>
<td>K-SADS; adolescent</td>
<td>Depressive disorders (DSM-III-R)</td>
<td>ODD + CD (DSM-III-R)</td>
<td>Concurrent</td>
<td>8.0%; 5.3 (1.8-15.7)</td>
<td>12.1%; 2.1 (1.4-3.1)</td>
</tr>
<tr>
<td>Fergusson et al. 1993</td>
<td>965 - 986; m and f</td>
<td>Birth cohort</td>
<td>15</td>
<td>DISC, SRED, RBPC; adolescent, parent</td>
<td>Mood disorders (DSM-III-R)</td>
<td>ODD + CD</td>
<td>Not reported</td>
<td>3.4 (1.9-6.3)</td>
<td></td>
</tr>
<tr>
<td>Garnefski and Diekstra 1997</td>
<td>11,516; m and f</td>
<td>Subsample from random school sample</td>
<td>12 - 18</td>
<td>Monitoring-the-Future Questionnaire; adolescent</td>
<td>Emotional problems</td>
<td>Aggressive/criminal behaviours</td>
<td>Not reported</td>
<td>35.4%</td>
<td></td>
</tr>
<tr>
<td>Loeber et al. 1998</td>
<td>506; m</td>
<td>Stratified random school sample</td>
<td>14</td>
<td>SRD, CBCL, TRF, YSR, DISC-P, MFQ, crime record; adolescent, parent, teacher</td>
<td>Depressed mood</td>
<td>Delinquency</td>
<td>Not reported</td>
<td>1.7 (CI not reported)</td>
<td></td>
</tr>
<tr>
<td>Miller-Johnson et al. 1998</td>
<td>340; m and f</td>
<td>Stratified random school sample</td>
<td>Grade 6</td>
<td>CAS; adolescent</td>
<td>Depressive symptoms</td>
<td>Conduct symptoms</td>
<td>Not reported</td>
<td>11.2%</td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>N; gender</td>
<td>Study population</td>
<td>Age (years)</td>
<td>Assessment method; source of information</td>
<td>Definition of depression</td>
<td>Definition of antisocial behaviour</td>
<td>Timeframe of comorbidity</td>
<td>Rates of comorbidity (%); OR (CI)</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Kaltiala-Heino et al. 2000</td>
<td>17 643; m and f</td>
<td>School sample</td>
<td>14 - 16</td>
<td>Questionnaire; adolescent</td>
<td>Depressive symptoms</td>
<td>Frequent bullying at school</td>
<td>Not reported</td>
<td>m: 13.0% f: 25.5% m and f: 4.3 (3.4-5.7)</td>
<td></td>
</tr>
<tr>
<td>Flannery et al. 2001</td>
<td>484; m and f</td>
<td>School sample</td>
<td>14 - 19</td>
<td>TSC-C, self-reported rating scale for violence not specified; adolescent</td>
<td>Depression</td>
<td>Dangerous violence</td>
<td>Not reported</td>
<td>m: 1.3 (0.7-2.3) f: 6.4 (2.1-19.0)</td>
<td></td>
</tr>
<tr>
<td>Costello et al. 2003</td>
<td>1 420; m and f</td>
<td>Random sample</td>
<td>9 - 16</td>
<td>CAPA; adolescent, parent</td>
<td>CD (DSM-IV)</td>
<td>Concurrent</td>
<td>m: 0.7 (0.2-2.4) f: 10.6 (2.0-54.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gomes et al. 2003</td>
<td>2 001; m and f</td>
<td>Random school sample</td>
<td>12 - 18</td>
<td>Self-reported scales*; adolescent</td>
<td>Emotional problems</td>
<td>Delinquency</td>
<td>12 months</td>
<td>16.7%</td>
<td></td>
</tr>
<tr>
<td>Kaltiala-Heino et al. 2003</td>
<td>36 549; m and f</td>
<td>School sample</td>
<td>14 – 16</td>
<td>Questionnaire; adolescent</td>
<td>Depressive symptoms</td>
<td>Externalizing problems: drunkenness, other substance use, bullying, truancy</td>
<td>Not reported</td>
<td>m: 6.2% f: 9.7%</td>
<td></td>
</tr>
<tr>
<td>West et al. 2003</td>
<td>1 860; m and f</td>
<td>Cohort, school sample</td>
<td>15</td>
<td>Voice-DISC; adolescent</td>
<td>Depressive disorders (DSM-IV)</td>
<td>ODD + CD (DSM-IV)</td>
<td>Concurrent</td>
<td>5.6 (2.9-10.8)</td>
<td></td>
</tr>
<tr>
<td>Maughan et al. 2004</td>
<td>10 438; m and f</td>
<td>Systematic sampling</td>
<td>5 – 15</td>
<td>DAWBA; adolescent, parent, teacher</td>
<td>CD (DSM-IV)</td>
<td>Not reported</td>
<td>m: 13.2 (5.5-31.7) f: 3.6 (0.7-17.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sihvola et al. 2007</td>
<td>1 854; m and f</td>
<td>Twins</td>
<td>14</td>
<td>SSAGA; adolescent, parents</td>
<td>MDD (DSM-IV)</td>
<td>ODD</td>
<td>Lifetime</td>
<td>11.6%; 7.0 (1.3-38.2) 37.2%; 4.8 (2.2-10.6)</td>
<td></td>
</tr>
</tbody>
</table>

(continued)
Table 4. (continued)

| CAPA | The Child and Adolescent Psychiatric Assessment, |
| CAS  | Child Assessment Schedule, |
| CBCL | the Child Behavior Checklist, |
| CD   | Conduct Disorder |
| CI   | confidence interval, |
| DAWBA| the Development and Well-Being Assessment, |
| DISC | Diagnostic Interview Schedule for Children, |
| DISC-P| Diagnostic Interview Schedule for Children (parent-version), |
| DSM-III-R| Diagnostic and Statistical Manual of Mental Disorders, third edition revised, |
| DSM-IV| Diagnostic and Statistical Manual of Mental Disorders, fourth edition, |
| TRF  | the Teacher Report Form, |
| YSR  | the Youth Self-Report, |
| Voice-DISC | a computer administered version of DISC, |
| SSAGA| the Semi-Structured Assessment for the Genetics of Alcoholism, |
| SRED | the Self-Report Early Delinquency, |
| OR   | odds ratio, |
| CI   | confidence interval, |
| K-SADS| The Schedule for Affective Disorders and Schizophrenia for School-Aged Children, |
| f    | females, |
| m    | males, |
| MDD  | Major Depressive Disorder, |
| MFQ  | the Recent Mood and Feelings Questionnaire, |
| ODD  | Oppositional Defiant Disorder, |
| VOICE-DISC | a computer administered version of DISC, |
| Voice-DISC | a computer administered version of DISC, |
| *    | emotional problems measured by modified version of scale by Boyle and Offord (1994), delinquency scale not specified |
Although not consistently reported (e.g. Kovacs et al. 1988, Mitchell et al. 1988, Lewinsohn et al. 1995a, Costello et al. 1996, Domalanta et al. 2003, Maughan et al. 2004), depression may be more frequent among antisocially behaving females than males (e.g. Herkov and Myers 1996, Overbeek et al. 2001, McCabe et al. 2002, Costello et al. 2003, Vermeiren 2003). For instance, Flannery et al. (2001) found antisocially behaving females to be almost three times more likely to be depressed than antisocial males. Rates of comorbid depression may vary between subtypes of antisocial behaviour. For instance, Rowe et al. (2006) found that depression was independently associated with oppositionality and delinquency but not with physical aggression whereas, Burke et al. (2005) found that ODD predicted independently subsequent depression whereas CD did not. On the other hand, some there is evidence that comorbid depression is more prevalent in those with CD than with ODD (Wolff and Ollendick 2006). Chiles et al. (1980) and Haapasalo and Hämäläinen (1996) found no differences in delinquency patterns in relation to depression, but as contrary, Vermeiren et al. (2002a) found a linear relationship between severity of depression and severity of delinquency.

Interaction between age and comorbidity between depression and antisocial behaviour has been less studied and the results are not consistent. Depression may be more frequent among LCP adolescents than AL adolescents (Vermeiren 2003) as well younger adolescents seem to have stronger co-occurrence than older adolescents and young adults (Loeber and Keenan 1994, Overbeek et al. 2001, Karlsson et al. 2006b). However, Loeber et al. (1994) and Wu et al. (1999) found comorbidity between depression and antisocial behaviour to increase from childhood to adolescence and to reach its peak in middle adolescence. Kovacs et al. (1988) reported that older age-at-onset of depression was associated with presence of comorbid CD. Herkov and Myers (1996) found no difference in relation to age between pure depressed adolescents and depressed adolescents with antisocial behaviour.

2.4.3 Models on the development of comorbid depression and antisocial behaviour in adolescence

Although numerous studies have demonstrated that depression and antisocial behaviour co-occur far more often than would be expected by chance (Loeber and Keenan 1994) and that this co-occurrence is not a methodological artefact (Angold et al. 1999, Wolff and Ollendick 2006), the underlying mechanism of comorbidity and the longitudinal associations between these disorders are
still unclear (Fergusson et al. 1996, Measelle et al. 2006, Rutter et al. 2006, Wolff and Ollendick 2006). In fact, there are surprisingly few studies on this topic in adolescence, and the existing results are inconsistent (Capaldi 1992, Loeber et al. 2000a). Further, different constructions in defying antisocial behaviour complicate conclusions. Research on comorbidity between antisocial behaviour and depression, and on developmental associations is, however, important because it has implications for classification systems, etiology and treatment (Keiley et al. 2003).

In studying developmental associations between depression and antisocial behaviour the concept of heterotypic continuity is pivotal. Heterotypic continuity refers to a continuous process in which one disorder generates manifestations of different forms over time or in which one disorder exposes adolescents to different disorders at different ages (Angold et al. 1999, Costello et al. 2003). There are basically at least three possible developmental models to explain the heterotypic continuity between adolescent depression and antisocial behaviour: acting out, failure and mutual influence models (Fergusson et al. 1996, Overbeek et al. 2001, Wolff and Ollendick 2006). Earlier studies have found some evidence to support all these models. The models differ in whether they assume associations to be causal (one disorder creates an increased risk for the other) or non-causal (association is based on non-specific risk factors) or disorders are reciprocally associated with each other (Caron and Rutter 1991, Fergusson et al. 1996, Overbeek et al. 2001, Wiesner 2003).

**Acting out model**

The acting out model is based on psychoanalytic theory proposing that depressed adolescents act out internalizing problems by masking them with antisocial behaviour (Capaldi 1992, Overbeek et al. 2001, Wolff and Ollendick 2006). The concept of “masked depression” refers to depressive features which are not traditionally associated with depression (e.g. stealing or lying) and they are thought to mask traditional depressive symptoms (Toolan 1962, Glaser 1968). Thus, depression precedes antisocial behaviour, and the cross-lagged associations are unidirectional and causal (Capaldi 1992, Overbeek et al. 2001). Depressed adolescents may develop antisocial behaviour as irritability and hopelessness (which are often associated with depression) become more severe, which, in turn, may contribute to conflicts with others and increased likelihood that adolescents engage in antisocial and risky behaviours (Measelle et al. 2006, Wolff and Ollendick 2006). Similarly, the negative affect associated with depression may be annoying or irritating to others, resulting in conflictual relationships with others, peer rejection and affiliation with deviant peers, which increases a risk to a person’s own antisocial behaviour (Oland and Shaw 2005). On the other
hand, it has been reported that acting out depression is likely to be associated especially with a family history of depression (Karnik et al. 2006).

The acting out model was first introduced by Kovacs et al. (1988), who found in a clinical sample that 56% of the children (aged 8 to 13 years) developed depressive disorders prior to antisocial behaviour compared to 25% of those who developed antisocial behaviour prior to depression. It was concluded that antisocial behaviour developed mostly as a complication of the depression. Loeber et al. (1994) found that depression in early adolescent males was associated with escalation to more serious delinquency and a variety of delinquent behaviour but by contrast, Leadbeater et al. (1999) and Vermeiren et al. (2002b) found depression to be protective against recidivism.

**Failure model**

The failure model assumes that there is a causal, unidirectional association between antisocial behaviour and depression. Antisocial behaviour emerges first and the ensuing experiences of social failure contribute to the development or to the vulnerability to depression (Overbeek et al. 2001). Antisocial adolescents usually face many problems in social relations (e.g. peer rejection, lack of social support, conflict with parents and teachers), have low social competence and poor coping skills and encounter problems in academic attainment which all in turn may lead to experiences of failure. Such failures often affect social development and contribute to or confirm associations with deviant peers and negative attitudes, which in turn contribute to depression (Capaldi 1992, Capadi and Stoolmiller 1999, Kiesner 2002). In addition, it has also been reported that when depression is secondary to antisocial behaviour, antisocially behaving adolescents are likely to have a family history of antisocial behaviour (Karnik et al. 2006).

The failure model was first introduced by Patterson and Capaldi (1990) and later supported by a longitudinal study by Capaldi (1992), reporting that antisocial behaviour among 12-year-old boys predicted increased depression in a 2-year span but not vice versa. Similar results from community samples have later been reported e.g. by Rohde et al. (1991), Feehan et al. (1993), Kiesner (2002) and Fergusson et al. (2003). Nock et al. (2006) found that CD preceded depression in 72% of cases compared to 19% of those who developed depression prior to CD. In a Finnish sample, Pelkonen et al. (2003) found that among boys problems with the law at age 16 predicted subsequent depression at age 22 (OR 3.0).
**Mutual influence model**

According to the mutual influence model comorbidity between depression and antisocial behaviour results from non-specific (shared or overlapping) risk factors and life pathways which lead to both disorders, and disorders are also reciprocally reinforcing/effecting on each other over time. The onset of one disorder increases vulnerability to the other and vice versa. Therefore, cross-lagged and bidirectional associations between disorders are possible (Overbeek et al. 2001, Wolff and Ollendick 2006). However, the interaction between depression and antisocial behaviour may not be symmetrical in that each disorder affects the other to the same degree (Loeber and Keenan 1994). Wolff and Ollendick (2006) proposed antisocial behaviour to have a stronger effect on depression than vice versa, but Beyers and Loeber (2003) reported that depression had a more robust effect on antisocial behaviour than vice versa. Many biological, psychological and psychosocial risk factors may contribute to the comorbidity (Fergusson et al. 1996, Weisbrot and Ettinger 2002, Wolff and Ollendick 2006). E.g. O’Connor et al. (1998) found that 45% of the observed covariation of comorbidity between depression and antisocial behaviour was accounted for by common genetic liability. Poor family functioning and parenting that is low in warmth are other examples of shared risk factors for depression and antisocial behaviour (Lahey et al. 2002). The mutual influence model has been supported by some researchers (e.g. Beyers and Loeber 2003, Wiesner 2003, Wolff and Ollendick 2006). In a community sample of adolescent females Measelle et al. (2006) found that initial levels of antisocial behaviour predicted increases in depression, whereas initial level of depression predicted slower decreases in antisocial behaviour. In a clinical sample of preadolescent males Lahey et al. (2002) found that depression increased with age and this change was accompanied by concurrent increases in antisocial behaviour, whereas antisocial behaviour predicted subsequent depression.

Not all studies have found evidence for heterotypic continuity between depression and antisocial behaviour (Overbeek et al. 2001, Costello et al. 2003, Marmorstein and Iacono 2003, Roza et al. 2003, Ingoldsby et al. 2006). Several reasons might explain the differing results, such as disparity of research methods (e.g. characterics of the sample, definitions of antisocial behaviour) or that longitudinal associations may be age-related or that some unmeasured factor (e.g. family conflict) may moderate the association (Overbeek et al. 2001, Ingoldsby et al. 2006).

Studies on gender differences among the longitudinal associations between depression and antisocial behaviour in adolescence are rare. Wiesner (2003) found limited evidence that antisocial
behaviour among males preceded depression but not vice versa. Among females a circular process was found as high level of antisocial behaviour preceded high level of depression, which in turn preceded de-escalation of antisocial behaviour, which finally resulted in lower level of depression. Rowe et al. (2002) found that ODD predicted subsequent depression among females, but not among males. In the study by Hofstra et al. (2002) antisocial behaviour in childhood and adolescence predicted only males’ mood disorders in adulthood. Overbeek et al. (2001) found no gender differences, suggesting that there are no cross-lagged associations between depression and antisocial behaviour as homotypic continuity of the disorders best explains the future course of depression and antisocial behaviour.

2.4.4 Course and consequences of comorbid depression and antisocial behaviour in adolescence

Results on the predictive power of antisocial behaviour for the recurrence of depression have been inconsistent, as some studies have reported less frequent (Harrington et al. 1991) and others similar rates of recurrence of depression (Fombonne et al. 2001a). Kovacs et al. (1988) reported that comorbid CD did not affect symptom presentation of depression or the duration of depression. Sanford et al. (1995) found a trend that persistent depression might be more frequent in those with comorbid antisocial behaviour. Similarly, the results regarding the effect of depression on the course of antisocial behaviour are inconsistent. For instance, Harrington et al. (1991) and Capaldi (1992) found that depression had little effect on the course of conduct disorder or on rates of adult crimes. By contrast, Sourander et al. (2007) reported that children with comorbid conduct and internalizing problems at age 8 had the poorest outcomes and highest risk of subsequent psychiatric disorders, criminal offences and overall self-reported problems in late adolescence. On the other hand, there is some evidence that depression protects adolescents against subsequent antisocial behaviour (Vermeiren et al. 2002b).

Suspension from school, deficits in academic skills, earlier age of sexual intercourse, self-injurious behaviour, suicidality, global dysfunctioning, substance abuse and treatment utilization are more frequent among depressed adolescents with antisocial behaviour than among either of these disorders alone (Capaldi 1991, Harrington et al. 1991, Capaldi 1992, Lewinsohn et al. 1995a, Miller-Johnson et al. 1998, Wu et al. 1999, Marmorstein and Iacono 2001 and 2003, Simic and
Fombonne 2001, Ingoldsby et al. 2006). When adult, adolescents with both depression and antisocial behaviour have been reported to have higher rates of occupational problems and unemployment, low income and educational level, pervasive social dysfunction and problems in everyday coping, substance abuse, antisocial personality disorder, suicidal behaviours and criminality than depressed adolescents without antisocial behaviour (Harrington et al. 1991, Fombonne et al. 2001a and 2001b). However, not all studies have found the combination of depression and antisocial behaviour to predict the poorer outcome. For instance, Capaldi and Stoolmiller (1999) found that although both depression and antisocial behaviour were associated with adverse outcomes in multiple domains in young adulthood, the interaction of these disorders did not predict greater risk for any single domain over than either disorder alone.

2.5 Summary of the literature reviewed

In the light of current evidence, depression and antisocial behaviour are two of the most common forms of juvenile psychopathology. Both the incidence of depression and the incidence of delinquency reach their peak in middle adolescence. Depression is twice as common among adolescent females as males, and this gender difference seems to be greatest between ages 15 and 18. In general, more males engage in antisocial behaviour, although the sex ratio varies in relation to the subtypes of antisocial behaviour. Both depression and antisocial behaviour have a multietiological background and in fact, they are reported to be risk factors for each other. Social support is inversely associated with both depression and antisocial behaviour. Depression and antisocial behaviour are accompanied by a variety of psychosocial problems which may have significant negative effects on adolescent development and psychosocial adjustment. Comorbidity is very common in both disorders and is likely to increase psychosocial impairment and complicate treatment. Thus, depression and antisocial behaviour can be considered as major public health problems.

Reportedly, depression and antisocial behaviour disorders have considerable continuity both in later adolescence and in adulthood. However, possible gender differences in the continuity of these disorders need to be further studied. Notably, although studies of antisocial behaviour based on female samples have increased in recent years, there is still relatively little psychiatric research on antisocial females.
While the magnitude and importance of the comorbidity between adolescent depression and antisocial behaviour has already been acknowledged, further detailed knowledge about the interrelations between these disorders is still needed. Major issues not sufficiently studied so far are whether depression affects the patterns of antisocial behaviour, and possible gender differences in these patterns. Similarly, although a number of studies have reported inverse associations both between social support and depression/antisocial behaviour, apparently no study has so far investigated whether social support mediates the comorbidity between depression and antisocial behaviour or if comorbidity is independent of social support. In addition, comorbidity between depression and antisocial behaviour has mostly been investigated among referred and institutionalized adolescents, which limits the generalizability of the findings. Thus, research conducted in community samples is indicated. Further, most of the studies have been conducted in the United States or in the UK, in continental Europe and especially in the Nordic countries only few studies have focused on this topic in general community samples. Because cultural and social differences may influence the association between disorders, it is essential to assess comorbidity in different countries and in different cultures.

Surprisingly few studies on the longitudinal associations between depression and antisocial behaviour have been conducted in adolescent community samples, and the findings are inconsistent. Thus, the underlying mechanism of comorbidity between these disorders is still unclear. Many studies have found that antisocial behaviour precedes depression, but because of the wide disparity of research methods (e.g. age distributions of the samples, sex ratio, length of follow-up period, definitions of antisocial behaviour) strict conclusions are difficult to draw. In addition, most of the studies so far have investigated longitudinal associations between these disorders using only one developmental model as a theoretical framework. It would be interesting to simultaneously test different developmental models to explain the longitudinal association between depression and antisocial behaviour.

Studies on gender differences on the longitudinal associations between depression and antisocial behaviour in adolescence are rare. Given that the rates of depression and antisocial behaviour and the course of these disorders differ among males and females, it could be assumed that longitudinal associations between these disorders also differ between genders. Knowledge about developmental associations is essential for the development of both effective prevention and interventions for depression and antisocial behaviour.
3. AIMS OF THE STUDY

The general aim of this study was to analyse associations between self-reported depressive symptoms and antisocial behaviour both concurrently and longitudinally in a community sample during middle adolescence. Unless otherwise stated, the term antisocial behaviour is used as an umbrella term to refer to diverse delinquent behaviours and symptoms of CD and ODD which violate societal norms and/or the rights of others and/or are against the law.

The specific aims of the study were:

I To investigate the association between self-reported depressive symptoms and delinquent behaviour.

II To investigate the patterns of delinquent behaviour (frequency, versatility and specialization) among depressed and non-depressed repeatedly delinquent adolescents.

III To investigate interrelations between self-reported depressive symptoms, antisocial behaviour and perceived social support.

IV To investigate homotypic continuity, concurrent comorbidity and longitudinal associations (the failure model and the acting out model) between self-reported depressive symptoms and antisocial behaviour during a two-year follow-up in middle adolescence.
4. MATERIALS AND METHODS

The present study is based on two Finnish community studies among adolescents: the School Health Promotion Study and the Adolescent Mental Health Cohort Study.

4.1 The School Health Promotion Study (I and II)

The School Health Promotion Study (SHPS) is a nationwide cross-sectional school survey carried out biannually in the same municipalities since 1996 among Finnish adolescents in about 90% of all municipalities in Finland. SHPS examines adolescents’ health-related behaviour, health, school as a work environment and living conditions. SHPS is co-ordinated by STAKES, the University of Jyväskylä and the University of Tampere. The study has been approved by the Ethical Committee of Tampere University Hospital. The survey is conducted during a regular school lesson in comprehensive schools (grades 8th and 9th) and in high schools (grades 1st and 2nd) (Luopa et al. 2003, http://info.stakes.fi/kouluterveyskysely).

4.1.1 Sample and procedures (I and II)

The subjects of the present study were adolescents from 8th and 9th grades of the comprehensive schools who participated in SHPS in 2002. In 2002 SHPS was conducted in three of the six administrative divisions in Finland (Lapland, East Finland and South Finland) and covered 150 municipalities. These divisions include urban and rural municipalities of different sizes, so the sample is representative of Finnish adolescents from diverse living environments. The survey was completed anonymously during a regular school lesson under the supervision of a teacher. Adolescents absent on the survey day were not contacted. 416 comprehensive schools took part in the survey. These schools had a total of 66, 039 pupils, of whom 53, 524 adolescents (81%) responded to the survey (Luopa et al. 2003).
In Study I, 2,955 of the responses (5.5% of the respondents) were excluded from the study because of the incomplete responses on the depressive symptoms scale. Thus, the final sample was 50,569 adolescents (50.1% males). Subjects’ mean age was 15.3 years (std. 0.6, range 14-16 years). Of the subjects 65.4% lived in urban municipalities, 76.5% were living with both parents and 74.5% had lived in the same area for over 9 years. Stable employment of their parents (not unemployed during the past years) was reported by 72.5% of the subjects and 29.8% of the subjects had parents (one or both) who had completed an academic degree.

Study II focused on a subsample of the SHPS in 2002. Adolescents in this subsample (n=3,825) had committed at least one type of offence at least five times during the past 12 months. Of these adolescents, 146 (3.8% of the subsample) were excluded because of incomplete responses on the depressive symptoms scale. Thus, the final sample in Study II was 3,679 (69.3% males), and these adolescents are called “repeatedly delinquent adolescents”. Subjects’ mean age was 15.3 years (std. 0.6, range 14-16 years). Of these subjects, 66.2% lived in urban municipalities, 67.4% were living with both parents and 67.7% had lived in the same area for over 9 years. Stable employment during the past year of at least one parent was reported by 63.6% of the subjects and 31.6% of the subjects had parents (one or both) who had completed an academic degree.

4.1.2 Measures (I and II)

Self-reported depressive symptoms were assessed by a Finnish modification (RBDI; Raitasalo and Notkola 1987, Raitasalo 1995, Kaltiala-Heino et al. 1999b) of the 13-item Beck Depression Inventory (BDI; Beck and Beck 1972, Beck et al. 1974). The 13-item BDI is a shortened version of the original 21-item Beck Depression Inventory (Beck and Beck 1972, Beck et al. 1988, Myers and Winters 2002). The 13-item BDI was developed for screening purposes, and it has been reported to represent mainly one cognitively oriented symptom dimension (Beck et al. 1988, Raitasalo 1995). The diagnostic efficiency of the 13-item BDI is good (Beck et al. 1988, Bennett et al. 1997, Fountoulakis et al. 2003). In the RBDI an introductory question and one positive choice answer were added for each item. Thus, RBDI constructs a dimensional continuum in which positive mood and depressive symptoms are the two end points of the continuum (Raitasalo 1995, Kurki et al. 2000, Konu 2002). The RBDI has good reliability and validity, and it has been widely used among...
Each of the 13 items of the RBDI is scored 0 – 3 according to the severity of the symptom as estimated currently (today). The original version of the RBDI includes one item on suicidal ideation. This item, however, was excluded from the SHPS 2002 because of the decision of the Finnish Ministry of Education, which did not allow the use of this item for fear that asking about suicidality might provoke it in adolescents. Results from previous samples have demonstrated that the original threshold of the RBDI can be used even without the suicidality item (Kaltiala-Heino et al. 1999b). Thus, in the present study sum scores of the 12 items were dichotomised to none/mild depressive symptoms (0–7 scores) and moderate/severe depressive symptoms (8–36 scores) as recommended by Beck and Beck (1972) and as has been done in earlier studies on Finnish adolescent population samples (e.g. Kaltiala-Heino et al. 1999a, Fröjd et al. 2006a). Adolescents scoring in the none/mild range are referred to as “non-depressed adolescents” and adolescents scoring in the moderate/severe range are referred to as “depressed adolescents”.

In Studies I and II term delinquency as a definition of antisocial behaviour was used because the behaviours in question are criminal offences. The self-report questions on delinquent behaviour in SHPS 2002 were adopted from the Finnish Self-Reported Delinquency Study (FSRD) conducted by the National Research Institute of Legal Policy of Finland (Kivivuori 2002a). The FSRD in turn is a modified version of the International Self-Report Delinquency Study I (ISRD-I) instrument which covers widely different delinquency measures (Junger-Tas 1994b). Originally the ISRD-I was used for comparing delinquency among adolescents in 13 western countries in the 1990’s (Junger-Tas 1994b), since then it has been widely used in many studies and has been shown in test-retest studies to have adequate reliability (Zhang et al. 2000).

In SHPS 2002 involvement in delinquent behaviour during the past 12 months was originally measured by six domains of delinquency: graffiti writing/drawing (question 1), vandalism at school (question 2), vandalism at other public places than school (question 3), shoplifting (question 4), physical fighting (question 5) and beating someone up (question 6). Originally the response categories were “never”, “once”, “two to four times” and “five or more times”. Preliminary analysis, however, revealed that the two vandalism variables (questions 2 and 3) and the two violent behaviour variables (questions 5 and 6) correlated (the weighted Kappa was 0.69 and 0.62 respectively). Therefore questions 2 and 3 were combined into a single variable, called vandalism,
and questions 5 and 6 were combined into a single variable, called violent behaviour. In Study I, these four different domains of delinquent behaviour (graffiti writing/drawing, shoplifting, vandalism and violent behaviour) were used in the main analyses. Response categories in these analyses were “never”, “once to four times” and “five or more times” in the past year. In Study II, graffiti writing/drawing was excluded from the final analyses because versatility and specialization of delinquency was to be studied between different domains of delinquency, and vandalism and graffiti writing/drawing were considered to be qualitatively similar to each other. Thus, in Study II three different domains of delinquent behaviour were used in the main analyses: shoplifting, vandalism and violent behaviour. The original response categories from the SHPS 2002 were used to capture the versatility and specialization of delinquency.

Association between self-reported depressive symptoms and delinquent behaviour was studied by comparing the frequencies of delinquency between depressed and non-depressed adolescents (I). Differences in delinquent activities between depressed and non-depressed repeatedly delinquent adolescents were assessed by comparing the frequencies of delinquency between the groups (II). Versatility of delinquency among depressed and non-depressed adolescents was assessed according to how many different types of delinquent acts respondents had repeatedly committed (II). For this analysis, delinquency committed at least five or more times in the past year was considered as repeated. Each type of delinquent acts was dichotomized to “five or more times” vs. “four or less times” in the past year. Then a sum score of these different delinquent acts was formed to illustrate the versatility of delinquent behaviour. The resulting categories were: “one delinquent act repeatedly”, “two different types of delinquent acts repeatedly” and “three different types of delinquent acts repeatedly”. Specialization in given types of delinquent acts in relation to self-reported depressive symptoms (II) was studied by classifying adolescents as “repeat specialist shoplifters” if they had stolen at least five times in the past year but had not also committed repeated acts of vandalism or violence over the same period. “Specialist vandals” and “specialist violent offenders” were classified by similar procedures. Those adolescents who had repeatedly committed several offences from all three categories were classified as “versatile delinquents”.

Age, sex, family structure (nuclear family, step-parent family, single-parent family and adolescent living apart from parents), parental educational level (academic, vocational and basic school), parental unemployment during the past year (none, one parent and both parents), years of living in the same municipality (nine years or more, five to nine years, one to four years or less than one year) and degree of urbanization of place of residence (rural, semi-urban and urban) were
investigated as sociodemographic variables (I). These variables were included as covariates because earlier studies have shown them to be associated both with adolescent depression and delinquency (Wichstrom et al. 1996, Loeber et al. 1998, Kaltiala-Heino et al. 2001).

4.1.3 Data analyses (I and II)

To study association between self-reported depressive symptoms and delinquent behaviour adjusted by sociodemographic variables multivariate logistic regression analyses [Odds ratio (OR), 99% confidence interval (CI)] was used (I). Delinquent behaviours were entered simultaneously as independent variables and depressive symptoms as the dependent variable. Analyses were conducted separately for males and females using SPSS for Windows version 11.0.

To study patterns of delinquency among depressed and non-depressed repeatedly delinquent adolescents Pearson $\chi^2$-test was used (II). Multinominal logistic regression models (OR, 95% CI) were also used to examine the association between versatility of delinquency (dependent variable) and self-reported depressive symptoms (independent variable). All analyses were conducted separately for males and females. SPSS for Windows version 11.0 and Statxact version 4.0 were used.

4.2 The Adolescent Mental Health Cohort Study (III and IV)

The Adolescent Mental Health Cohort Study (AMHC Study) is an ongoing prospective cohort study conducted at baseline in two Finnish cities: Tampere (200,000 inhabitants) and Vantaa (180,000 inhabitants). The study examines epidemiology, comorbidity and risk and protective factors of non-psychotic mental disorders in adolescence starting from 15-year-olds. The study is carried out by the Tampere School of Public Health; Department of Mental Health, the National Public Health Institute; Tampere University Hospital and Helsinki University Hospital. The Ethical Committee of Tampere University Hospital approved the study. The AMHC Study will be conducted in three waves: baseline assessment, 2-year follow-up and 5-year follow-up (Fröjd et al. 2004, 2006b). The present study consists of the assessments at baseline (III) and 2-year follow-up (IV).
4.2.1 Baseline of the AMHC Study (III)

4.2.1.1 Sample and procedure (III)

The baseline study of the AMHC Study was conducted during the school term 2002 –2003. Ninth grade pupils of all the Finnish-speaking comprehensive schools (36) in the participating cities completed a person-identifiable questionnaire during a school lesson supervised by a teacher. The subjects were identified in the school registers of the participating cities. The parents were informed in advance by letter, but parental consent to participation was not required since a 15-year-old subject can decide alone on his/her participation according to the law on medical research. Subjects received written information on the study and signed an informed consent. For pupils absent from school on the original survey day, a separate opportunity to participate was offered in the school within a couple of weeks of the original data collection. For pupils not present on either occasion, the questionnaires were sent twice by post.

The adolescents in the participating schools totalled 3, 809, of whom 3, 597 responded to the survey (response rate 94.4%). Six respondents had to be excluded due to obvious facetiousness. Since it is possible for an adolescent under 15 years to be attending the 9th grade, respondents who were not yet 15 years old (n=313) were later excluded. Thus, the final sample was 3, 278 (50.9% males). The mean age was 15.5 (range 15.0 -19.9, sd 0.39). Of the respondents, 71% were living in two-parent families. Residential stability was high, as 67% of the respondents had been living in the same municipality for at least 9 years. At least one of the parents had a college or university degree in the case of 37% of respondents. In 75% of the subjects neither of the parents had been unemployed during the past year.

4.2.1.2 Measures (III)

Self-reported depressive symptoms were assessed by the RBDI (see Chapter 4.1.2). In Study III, all 13 items of the RBDI were included in the survey. Items were scored similarly as in Studies I and
II, resulting a sum score ranging from 0 to 39. Sum scores were dichotomised with similar cut-off points as in Studies I and II.

In Studies III and IV the term antisocial behaviour was used because some of the behaviours in question were not illegal although they violate social norms and/or the rights of others, and resemble CD and ODD. Antisocial behaviour was assessed by the externalizing scale of the Youth Self-Report (YSR). YSR, Child Behavior Checklist (CBCL) and Teacher Report Form (TRF) are parallel versions of symptom rating scales developed by Achenbach (1991) to assess a wide range of the competencies, emotional and behavioural problems of children and adolescents. The YSR is based on self-reports from adolescents aged 11-18 years. It consists of three broad-band scales of problems (Internalizing, Externalizing and Total Problems), and it has been widely used in earlier studies showing a good reliability and validity, and considerable consistency across different countries (Achenbach 1991, Kvernmo and Heyerdahl 1998, Achenbach 2000, Broberg et al. 2001, Helstelä and Sourander 2001, Verhulst et al. 2003, Hurtig et al. 2005, Kapi et al. 2007, Rescorla et al. 2007). For example, Morgan and Cauce (1999) found that high YSR scores on the Externalizing scale predicted a DISC-C-diagnosis of ODD or CD with reasonable sensitivity (0.74) and specificity (0.73). The Externalizing scale consists of 11 variables concerning delinquency and 18 variables concerning aggressive behaviour during the past 6 months. Each variable is scored 0 - 2 according to the frequency of antisocial behaviour. Sum scores of the 29 items (range 0 - 58) were dichotomised using the 90th percentile as a cut-off point into those within normal range versus those within clinical range. Because antisocial behaviour is usually more common among adolescent males than females, sex-specific cut-off points were used (Achenbach 1991). Cut-off points of antisocial behaviour for males and females were 24.0 and 25.0 respectively.

Perceived social support was assessed by the Perceived Social Support Scale-Revised (PSSS-R). The PSSS-R was presented by Blumenthal et al. (1987), and measures persons’ subjective perceptions of social support and emotional closeness, not the actual number of supportive contacts. It has been shown to be a valid method in assessing perceived social support among Finnish adolescents (e.g. Katainen et al. 1999). The PSSS-R contains 12 items on a five-point Likert-type scale. Three factor-analytically derived sum scores (each ranging 4 to 20) were used addressing perceived social support from family (4 items), from friends (4 items) and from significant other (4 items). High sum scores indicate high perceived social support. PSSS-R was used as continuous variable in associations between perceived social support and self-reported depressive symptoms and antisocial behaviour. In multivariate associations the PSSS-R was used as a categorical variable.
dichotomised according to the 25th percentile into those with low level of social support versus those with high level of social support. This was done because the distributions of the perceived social support scores were skewed.

Sex, family structure (nuclear family, step-parent family, single-parent family or other custodian), parental education level (academic, vocational or basic), parental unemployment during the past year (none, one parent or both parents) and years of living in the same municipality (9 years or more, 5-9 years, 1-4 years or less than 1 year) were investigated as sociodemographic variables. These variables were included as covariates because other studies have shown them to be associated with adolescent depression and antisocial behaviour (Wichstrom et al. 1996, Garnefski and Diekstra 1997, Loeber et al. 1998, Kaltiala-Heino et al. 2001, Harland et al. 2002).

4.2.1.3 Data analyses (III)

Associations between perceived social support and self-reported depressive symptoms and between perceived social support and antisocial behaviour were analysed by Mann-Whitney test, where all three types of perceived social support (family, friends and significant other) were analysed separately. Univariate associations between antisocial behaviour and self-reported depressive symptoms were analysed by Pearson $\chi^2$-test and by logistic regression (Model 1). Multivariate associations between self-reported depressive symptoms as a dependent variable and antisocial behaviour as an independent variable were adjusted by family support, friend support and significant other support, which were entered separately into the models (Model 2, Model 3 and Model 4). In Model 5 three perceived social support types were entered simultaneously to investigate the association of the antisocial behaviour for self-reported depressive symptoms. Finally covariates were added into the model to analyse the effect of potential confounding factors (Model 6). All analyses were conducted separately for males and females. Statistical analyses were performed using SPSS version 11.0.
4.2.2 Two-year follow-up of the AMHC Study (IV)

4.2.2.1 Sample and procedure (IV)

The 2-year follow-up of the AMHC Study was conducted during the academic year 2004–2005. Eligible participants in Study IV (now after T2) were those adolescents who participated in the baseline assessment of the AMHC Study (III, now after T1). Multiple approaches were used to contact the adolescents at T2 (Fröjd et al. 2006b). School based surveys like that at T1 were organised in upper secondary schools and vocational schools. Adolescents not reached through schools were contacted by postal survey. Finally, an Internet based survey was offered to those who had not yet responded via school or post.

A total of 2,070 adolescents completed surveys at both T1 and T2. The response rate of the sample at the follow-up was 63.1% (2,070/3,278). Of the respondents 43.6% (903) were males. The mean age at T2 was 17.6 years (range 16.9 to 21.6, std. 0.41). At T2, 62.4% of the adolescents were living in an intact family. Stable employment of the parents was high at T2, as only 6.2% of parents (one or both) had been unemployed during the past year. Over 80% of the adolescents were studying full-time at T2. 66.1% of the adolescents were studying at upper secondary school at T2. Stability of residence was high, as 93.3% of the adolescents had lived in the same municipality more than one year.

Non-participants at T2 were more likely to be males (63.4% vs. females 36.6%, p<0.001) and living more frequently with both parents (35.2%) than those adolescents who participated in both surveys (27.5%, p<0.001). Non-responders in the second survey were more likely to be depressed (11.7%) at T1 than those who participated in both surveys (9.1%) (p= 0.020). Drop-outs were also more likely to have displayed antisocial behaviour at T1 (12.3%) than participants (8.7%) (p<0.001).
4.2.2.2 Measures (IV)

Self-reported depressive symptoms and antisocial behaviour were assessed by the RBDI as in Study III and by the YSR as in Study III (see Chapter 4.2.1.2). In the YSR cut-off points at T1 were for females 23.0 (males 24.0) and at T2 for females 21.0 (males 22.0).

Sex, family structure (intact vs. non-intact), parental education level (academic vs. non-academic), parental unemployment during the past year (no vs. one or both) and residential stability (living 10 years or more vs. up to 9 years in the same municipality) at T1 were controlled for as sociodemographic variables. Previous studies have shown these variables to be associated with both adolescent depression and antisocial behaviour (Loeber et al. 1998, Kaltiala-Heino et al. 2001, Fröjd et al. 2006a).

4.2.2.3 Data analyses (IV)

Homotypic continuity of self-reported depressive symptoms and antisocial behaviour were first analysed by Pearson $\chi^2$-test, after which logistic regression analyses were performed to control for sociodemographic variables. To ascertain if there were significant sex differences in homotypic continuity, interaction terms for sex and self-reported depressive symptoms/antisocial behaviour were added into the basic model.

Concurrent comorbidity between self-reported depressive symptoms and antisocial behaviour was analysed both at T1 and at T2. Analyses were performed similarly at both waves. The proportions of those reporting depressive symptoms by antisocial behaviour were calculated by Pearson $\chi^2$-test. Similarly, the proportions of those reporting antisocial behaviour by depressive symptoms were calculated by Pearson $\chi^2$-test. Next, odds ratio (OR) with 95% confidence interval (CI) for comorbidity between antisocial behaviour (dependent variable) and depressive symptoms (independent variable) was performed by logistic regression analysis. To ascertain if there were significant sex differences in comorbidity, interaction terms for sex and depressive symptoms (independent variable) were added into the model.
To test whether the failure model explained longitudinal associations between self-reported depressive symptoms and antisocial behaviour, the proportions of those reporting depressive symptoms at T2 were calculated according to antisocial behaviour at T1 by Pearson $\chi^2$-test. Next, crude odds ratio (OR, 95% CI) for depressive symptoms at T2 (dependent variable) according to antisocial behaviour at T1 (independent variable) was calculated using logistic regression analysis (Model 1). Subsequently, odds ratio for depressive symptoms at T2 by antisocial behaviour at T1 was adjusted for depressive symptoms at T1 (Model 2) and finally also for sociodemographic variables (Model 3).

To test the acting out model in explaining longitudinal associations between self-reported depressive symptoms and antisocial behaviour, the proportions those reporting antisocial behaviour at T2 were calculated according to depressive symptoms at T1 by Pearson $\chi^2$-test. Next, crude odds ratio (OR, 95% CI) for antisocial behaviour at T2 (dependent variable) according to depressive symptoms at T1 (independent variable) was calculated using logistic regression analysis (Model 1). Subsequently, odds ratio for antisocial behaviour at T2 by depressive symptoms at T1 was adjusted for antisocial behaviour at T1 (Model 2), and finally also for sociodemographic variables (Model 3).

All analyses were conducted separately for males and females. Statistical analyses were performed with the SPSS 13.0 software package.

5. RESULTS

5.1 Association between self-reported depressive symptoms and delinquent behaviour (I)

Graffiti writing/drawing, vandalism and violent behaviour were all independently associated with self-reported depressive symptoms in both sexes after controlling for age and sociodemographic factors (I: Table 1). Shoplifting was independently associated with self-reported depressive symptoms only in females after adjustment. Among females risk for self-reported depressive symptoms varied between 1.3 and 3.1 according to the various delinquent behaviours. The equivalent risk among males was 1.3–2.5. Among females the strongest associations with self-reported depressive symptoms were detected for frequent vandalism (5 or more times) and among
males for frequent violent behaviour (5 or more times). In both sexes self-reported depressive symptoms increased according to the frequency of delinquent behaviour.

5.2 Patterns of delinquent behaviour among depressed and non-depressed repeatedly delinquent adolescents (II)

5.2.1 Frequency

Even among repeatedly delinquent adolescents, self-reported depressive symptoms differentiated frequencies of delinquent behaviour. Depressed males and females had both committed more repeated (5 or more times in the past year) shoplifting, vandalism and violent behaviour than non-depressed males and females (II: Table 1). The only exception was for the category of shoplifting, where non-depressed females had more often stolen repeatedly than had depressed females.

5.2.2 Versatility

Analysis of the versatility of repeated delinquency revealed that most of the non-depressed delinquent males (75.1%) had specialized in one offence type (vs. depressed delinquent males 50.1%, p< 0.001). The difference was in the same direction but less marked for non-depressed and depressed females (87.4% vs. 77.3% respectively, p<0.001). In other words, the delinquent behaviour of depressed adolescents was more versatile than that of non-depressed adolescents. It was over five times more likely that depressed males had repeatedly committed offences from all three categories of delinquent acts than had non-depressed males (OR 5.49, CI 4.26-7.07). Depressed females were about three times more likely to have repeated offences from all categories than non-depressed females (OR 2.78, CI 1.58-4.86) (II: Table 2).
5.2.3 Specialization

Non-depressed repeatedly delinquent males specialized mostly in violent offences (36.7%) (II: Table 3). Depressed repeatedly delinquent males were most frequently classified as versatile offenders (49.9%), but second most frequently they had also specialized in violent offences (27.1%). Among repeatedly delinquent females specialization in shoplifting was most typical among both depressed (41.0%) and non-depressed females (59.4%). Depressed females had more often specialized in repeat vandalism (19.2%) than non-depressed females (11.6%), and versatile offending was also more common among depressed females (22.7%) than among non-depressed females (12.6%). There were no differences in specialization in violent offences between depressed and non-depressed females (17.1% and 16.3% respectively).

5.3 Interrelations between self-reported depressive symptoms, antisocial behaviour and perceived social support (III)

5.3.1 Association between self-reported depressive symptoms and perceived social support

Perceived social support from family, friends and significant other were inversely associated with self-reported depressive symptoms (III: Table 1). Both depressed males and females reported significantly less social support than did non-depressed males and females. The difference in relation to social support between depressed and non-depressed adolescents was present in all sources of social support, but the difference in social support was most evident in both sexes in decreased social support from family (depressed males 11.3 vs. non-depressed males 16.6, p<0.001; depressed females 12.4 vs. non-depressed females 16.8, p<0.001).
5.3.2 Association between antisocial behaviour and perceived social support

Perceived social support from family, friends and significant other were inversely associated with antisocial behaviour among males (III: Table 1) as antisocially behaving males reported receiving less social support from all 3 sources than non-antisocial males (13.5 vs. 16.5, 13.9 vs. 14.8 and 13.1 vs. 14.6 respectively). Among females, only perceived social support from family was inversely associated with antisocial behaviour, as antisocially behaving females perceived less support from family than non-antisocial females (13.5 vs. 16.6 respectively).

5.3.3 Role of perceived social support in the comorbidity between self-reported depressive symptoms and antisocial behaviour

As expected, also in this sample antisocial behaviour was associated with self-reported depressive symptoms in both sexes. Depressive symptoms were far more common (p<0.001) among antisocial males (25.3%) and females (35.1%) than among non-antisocial males (4.5%) and females (11.1%). Antisocial males were seven times (OR 7.2, CI 4.7-11.0) more likely to be depressive than non-antisocial males (III: Table 2). Similarly, antisocial females were four times more likely to be depressive than non-antisocial females (OR 4.3, CI 3.0-6.2). Adding perceived social support factors separately into the model modified the comorbidity between self-reported depressive symptoms and antisocial behaviour differently. When the association between depressive symptoms and antisocial behaviour was adjusted by social support from family (III: Table 2, Model 2), the association of the antisocial behaviour for depressive symptoms decreased in both sexes compared to the unadjusted associations. Social support from friends (III: Table 2, Model 3) and social support from significant other (III: Table 2, Model 4) had an opposite effect on the association of the antisocial behaviour for depressive symptoms, as social support adjusted associations were slightly higher in both sexes than the unadjusted associations. When all social support factors were entered simultaneously into the model (III: Table 2, Model 5), the associations of the antisocial behaviour for depressive symptoms were OR 5.3 (CI 3.4-8.5) among males and OR 3.2 (CI 2.1-4.7) among females. Adding covariates into the model (III: Table 2, Model 6) did not remarkably alter the associations between depressive symptoms and antisocial behaviour, as the final odds ratios were 5.5 (CI 3.3-9.1) among males and 2.9 (CI 1.9-4.5) among females. Thus, regardless of
perceived social support, antisocial behaviour was independently associated with self-reported depressive symptoms.

5.4 Homotypic continuity, concurrent comorbidity and longitudinal associations between self-reported depressive symptoms and antisocial behaviour (IV)

5.4.1 Homotypic continuity

Self-reported depressive symptoms and antisocial behaviour showed considerable continuity in both sexes during the 2-year follow-up (IV: Table 1 and Table 2). Of the males depressed at T1, 27.8% of them were also depressed at T2. The corresponding proportion of females was 46.3%. Males with depressive symptoms at T1 had a 7.4-fold risk (CI 3.6-15.2) for depressive symptoms at T2 after adjustment for sociodemographic variables. The corresponding odds ratio for females was 12.5 (CI 7.8-20.0). There were no significant gender differences in continuity of self-reported depressive symptoms (p=0.108). Of the males and females reporting antisocial behaviour at T1, 43.5% of males and 42.0% of females still displayed antisocial behaviour at T2. Males with antisocial behaviour at T1 had a 14.6-fold risk (CI 8.3-25.6) for antisocial behaviour at T2 after adjustment for sociodemographic variables. The corresponding odds ratio for females was 8.3 (CI 5.4-12.9). There were no significant gender differences in continuity of antisocial behaviour (p=0.342).

5.4.2 Concurrent comorbidity

In the follow-up sample, concurrent comorbidity between self-reported depressive symptoms and antisocial behaviour was also high (IV: Table 3). Females with antisocial behaviour at T1 were three times more likely to be depressive than non-antisocial females (OR 3.5, CI 2.3-5.5). The corresponding risk at T2 was OR 5.1 (CI 3.3-7.9). Similarly, males with antisocial behaviour at T1 were seven times more likely to be depressive than non-antisocial males (OR 7.3, CI 4.0-13.2). The corresponding risk at T2 was OR 5.5 (CI 3.1-10.1). There were no significant gender differences in
comorbidity (at T2 p=0.836) although comorbidity at T1 almost reached statistical significance (p=0.055), suggesting that comorbidity may be more common among males.

5.4.3 Longitudinal associations

5.4.3.1 Failure model

Antisocial behaviour at T1 predicted self-reported depressive symptoms at T2 in both sexes when entered alone into the logistic regression analysis (IV: Table 4, Model 1), but when depressive symptoms at T1 and sociodemographic variables were controlled for (IV: Table 4, Model 2 and Model 3), the association between antisocial behaviour at T1 and depressive symptoms at T2 lost significance in both sexes. In other words, the failure model did not explain the longitudinal associations between self-reported depressive symptoms and antisocial behaviour during a 2-year follow-up in either sex.

5.4.3.2 Acting out model

Prior self-reported depressive symptoms predicted subsequent antisocial behaviour differently among females and males (IV: Table 5). Among females, depressive symptoms at T1 predicted antisocial behaviour at T2 after controlling for antisocial behaviour at T1 and sociodemographic variables. Females with depressive symptoms at T1 had a 2.3-fold risk (CI 1.3-3.9) for antisocial behaviour at T2. Among males depressive symptoms at T1 predicted inversely antisocial behaviour at T2 after controlling for antisocial behaviour at T1 and for sociodemographic variables. Thus prior self-reported depressive symptoms protected males from subsequent antisocial behaviour (OR 0.4, CI 0.1-1.0).
6. DISCUSSION

6.1 Associations between perceived social support and self-reported depressive symptoms and antisocial behaviour (III)

In line with earlier studies (Garnefski and Diekstra 1996, Lewinsohn et al. 1998, Helsen et al. 2000, Kaltiala-Heino et al. 2001), social support was inversely associated with self-reported depressive symptoms (III). Likewise consistent with earlier findings (Garnefski and Diekstra 1996, Lewinsohn et al. 1998, Helsen et al. 2000, Kaltiala-Heino et al. 2001), the difference in relation to social support between depressed and non-depressed adolescents was present in all sources of social support (family, friends and significant other), but the effect of the social support from family was most obvious in both sexes (III). Also in accordance with earlier findings (e.g. Garnefski and Diekstra 1996, Brook et al. 1999, Bru et al. 2001) social support was inversely associated with antisocial behaviour (III). However, the effect of social support from all sources was systematic only among males as among females only social support from family was inversely associated with antisocial behaviour (III). The finding parallels with the study of Bru et al. (2001) reporting that parental support was negatively associated with antisocial behaviour in both sexes, but lack of friend support was modestly associated with antisocial behaviour only among males. These findings emphasise the role of parents and family in a socialisation process and as prosocial role models in preventing antisocial behaviour. Earlier findings on the psychological closeness of antisocial adolescents’ friendships have been mixed (Depta and Cohen, 2004). In addition, little attention has been paid to the role of gender in the friendships of antisocial adolescents as many studies have focused exclusively on males.

6.2 Homotypic continuity of self-reported depressive symptoms and antisocial behaviour in middle adolescence (IV)

Consistent with earlier findings, self-reported depressive symptoms (e.g. Sanford et al. 1995, Beyers and Loeber 2003, Costello et al. 2003) and antisocial behaviour (e.g. Fergusson et al. 1996, Kim et al. 2003, Wiesner 2003) showed considerable homotypic continuity during the 2-year span
in middle adolescence (IV). Reportedly, the risk of continuity in adolescent depression is associated with high comorbidity (AACAP 1998, Birmaher et al. 2002) which was also common in the present study (IV). The findings emphasize the importance of prevention, early identification and efficient treatment of depressive symptoms and antisocial behaviour, given that both of these disorders are accompanied by range of long-term psychosocial problems and impairment (Rutter et al. 1998, Birmaher et al. 2002). This is crucial because important and long-reaching occupational and educational decisions are made in middle adolescence which may be adversely affected by depressive symptoms and antisocial behaviour.

The results in the present study (IV) concur with those of earlier studies reporting no significant gender differences either in the continuity of depressive symptoms (e.g. Ferdinand et al. 1995, Hankin et al. 1998) or in the continuity of antisocial behaviour (e.g. Ferdinand et al. 1995, Costello et al. 2003). However, since it has been reported that the continuity of severe antisocial behaviour may be higher among females than males (Loeber et al. 2000a), it is at least partly possible that in the present study (IV) this gender difference was not detected because of the use of the YSR which may not measure severe antisocial behaviour rather than more common forms of antisocial behaviour. In addition, because the present findings on continuity are based on 2-year interval assessments during follow-up (IV), it cannot with certainty be verified whether in the continuity of depressive symptoms it is a case of long duration or recurrence of symptoms. However, given that 75 to 90% of depressed adolescents tend to recover from depression in 6 to 24 months (Birmaher et al. 2002), the latter is likely to be the case. Nevertheless, the findings indicate that once they occur, depressive symptoms and antisocial behaviour are equally persistent in both sexes.

6.3 Concurrent comorbidity between self-reported depressive symptoms and antisocial behaviour in middle adolescence (I, II, III, IV)

Despite different rating scales of antisocial behaviour (FSRD and YSR) and different samples, concurrent comorbidity between self-reported depressive symptoms and antisocial behaviour was high in both sexes (I, II, III, IV). Estimates of the comorbidity between depressive symptoms and antisocial behaviour from the present study (I, II, III, IV) fell into the range reported earlier in studies on community adolescent samples (e.g. Loeber et al. 1998, p. 109, Flannery et al. 2001, West et al. 2003). Adolescents with antisocial behaviour had up to seven-fold risk of being
depressed (IV). The finding is remarkable, given that comorbidity between depressive symptoms and antisocial behaviour is reportedly a potential risk factor for increased psychosocial impairment in multiple domains, both in adolescence and in adulthood (Wu et al. 1999, Fombonne et al. 2001a and 2001b, Marmorstein and Iacono 2001 and 2003). Thus, research on comorbidity has implications for both the prevention and treatment of both depressive symptoms and antisocial behaviour.

The comorbidity between depression and antisocial behaviour has previously been reported especially in clinical and institutionalized samples (e.g. Herkov and Myers 1996, Pliszka et al. 2000, Vermeiren et al. 2000, Greene et al. 2002). However, studies focusing specifically on the association between delinquent behaviour and depression in a general adolescent population are rare. The present study (I and II) focused especially on this topic. Studies based on general adolescent population are needed because of the possible limitations of the generalizability of the findings conducted among incarcerated or referred adolescents. Delinquently behaving adolescents in the community may not yet have come to the attention of parents, teachers and mental health professionals although at least a subset of those may have depressive symptoms requiring immediate intervention. In addition, most of the earlier studies have been conducted in the United States or in the UK, in continental Europe and especially in the Nordic countries only few studies have focused on this topic in general community samples. Because cultural and social differences may influence the association between disorders, it is essential to assess comorbidity in different countries and in different cultures. Reportedly, e.g. differences in lethal violence between European and American adolescents are substantial (Rutter et al. 1998, p. 40, Savolainen et al. 2000), and it is still uncertain whether such factors interact with comorbidity between depression and delinquent behaviour. Further, it is unsure whether rates of depression in American samples are elevated given that even 7-year-old children can be convicted in the American judicial system.

Although a number of studies have reported inverse associations both between social support and depression/antisocial behaviour (e.g. Garnefski and Diekstra 1996, Peiser and Heaven 1996, Lewinsohn et al.1998), apparently no study has so far investigated whether social support mediates the comorbidity between depression and antisocial behaviour or if the comorbidity is independent of social support. The present study (III) addressed this gap in the research by controlling for the effect of perceived social support on comorbidity. The results indicated that, although perceived social support from family, friends and significant others modified comorbidity between self-reported depressive symptoms and antisocial behaviour, antisocial behaviour was still
independently associated with depressive symptoms (III). In other words, perceived social support did not explain the comorbidity identified between depressive symptoms and antisocial behaviour (III). In fact, the results indicated that antisocial adolescents are even more vulnerable to depressive symptoms if they simultaneously lack support from friends (III). However, it may also be that depressed antisocially behaving adolescents push away offers of social support or that they do not realise that they actually have social support as a part of feeling of loneliness. On the other hand, the measure of social support used in this study measures explicitly adolescents’ subjective perceptions of social support and emotional closeness, not actual number of supportive contacts. Therefore, the adolescents’ subjective perceptions of decreased support are valuable.

Consistent with some earlier studies (e.g. Kovacs et al. 1988, Mitchell et al. 1988, Domalanta et al. 2003), no significant gender differences in the comorbidity between self-reported depressive symptoms and antisocial behaviour were found (IV). The finding differs from most earlier studies (e.g. Flannery et al. 2001, Overbeek et al. 2001, McCabe et al. 2002, Vermeiren 2003) suggesting that depression is more prevalent among antisocial females than males. Differences in the findings may be a result of different samples as e.g. Flannery et al. (2001) focused on seriously violent adolescents whereas, the present study (IV) investigated antisocial behaviour in a general school sample. Disparity of assessment methods and variations in participants’ ages may also contribute to the difference.

6.4 Patterns of delinquent behaviour among depressed and non-depressed adolescents in middle adolescence (I, II)

Little is known about how adolescent depression is associated with the various forms of delinquent/antisocial behaviour. In the present study the risk for self-reported depressive symptoms varied according to the various forms of delinquent behaviours (I). Among females, the strongest association was found in frequent vandalism and among males in frequent violence (I). The findings concur with the study by Rey et al. (2005) reporting depression to be more prevalent among aggressive than non-aggressive delinquents, but does not corroborate with the study of Simic and Fombonne (2001) reporting that adolescents with comorbid depression and antisocial behaviour are less likely to destroy and to be less overtly aggressive than those with pure antisocial behaviour. Previously, Chiles et al. (1980) and Hämäläinen and Haapasalo (1996) found no differences in
patterns of delinquency in relation to depression. However, different definitions of antisocial behaviour/delinquency complicate the conclusions.

In the present study the risk for self-reported depressive symptoms increased according to the increased frequency of delinquency (I). It is specially noteworthy that even among repeatedly delinquent adolescents, self-reported depressive symptoms still differentiated frequencies of delinquency as repeat delinquency was far more common among depressed adolescents than among non-depressed adolescents (II). The reason for the exception that repeat shoplifting was more common among non-depressed girls (II) needs further study. The finding of increased intensity parallels with the studies by Loeber et al. (1994) and Vermeiren et al. (2002a) reporting depression to be associated with escalation to more serious antisocial behaviour, but does not concur with the study by Simic and Fombonne (2001). However, although rates of self-reported depressive symptoms increased as a function of increased delinquency, it is worth noting that the risk for depressive symptoms was increased even when there had been one single offence (I).

Earlier studies focusing on the possible differences between specialization and versatility of delinquency according to depression are scarce. In the current study specialization in one delinquency type was significantly more common among non-depressed repeatedly delinquent adolescents than their depressed counterparts (II). Earlier, specialization into one pattern of antisocial behaviour has been reported to be rare in adolescence (Gottfredson and Hirschi 1990, p. 91, Loeber and Stouthamer-Loeber 1998, Lahey et al. 1999a). Again, a number of methodological factors may contribute to this difference. The findings of the current study may at least partially reflect the relatively broad delinquency categories in the questionnaire used (Kyvsgaard 2003, p. 148). When specializing in one type of delinquency, both depressed and non-depressed delinquent males specialized mainly in repeat violent offences (II) which concurs with earlier studies reporting that in general, boys’ antisocial behaviour is overt and aggressive by the nature (Kann and Hanna 2000, Loeber et al. 2000a, Bassarath 2001). Among repeatedly delinquent females specialization in shoplifting was the most typical form among both depressed and non-depressed females (II) which also concurs with earlier studies reporting that in general, females’ antisocial behaviour is likely to be covert. Specialization in repeat vandalism was more frequent among depressed females than their non-depressed counterparts (II). Interestingly, self-reported depressive symptoms did not differentiate specialization in violent offences among females (II). Further study is needed to explain and replicate these findings.
The result indicating that the delinquent behaviour of depressed adolescents was more versatile than non-depressed adolescents was new (II). The versatile offending by depressed adolescents may be at least partly explained by anger and irritability, which are often associated with depression (Herkov and Myers 1996, Weisbrot and Ettinger 2002). These feelings could predispose depressed adolescents to misbehave in various ways rather than distinguishing between different types of offences. Further research on the exact mechanisms leading to the finding is needed. Nevertheless, the finding of versatile offending among depressed adolescents is worrying, given that in general, the more versatile antisocial behaviour is, the poorer outcome is to be expected (McMahon and Frick 2005).

6.5 Longitudinal associations between self-reported depressive symptoms and antisocial behaviour in middle adolescence (IV)

There are surprisingly few studies on longitudinal associations between depression and antisocial behaviour in adolescence, and the findings are mixed. The present study addressed this gap in the research by investigating simultaneously two different developmental models in a large community sample with both sexes (IV). Studying longitudinal associations between depression and antisocial behaviour yields important implications for the diagnostic classifications, etiology and course for both disorders, and therefore for prevention and for interventions regarding both disorders (Overbeek et al. 2001, Hankin 2006).

In contrast to several other studies (e.g. Capaldi 1992, Feehan et al. 1993, Kiesner 2002, Fergusson et al. 2003, Nock et al. 2006), the failure model did not explain the longitudinal associations between self-reported depressive symptoms and antisocial behaviour during follow-up in either sexes (IV). However, most studies have focused on the transition from late childhood to early adolescence (e.g. Capaldi 1992) or they have followed up participants from childhood to young adulthood (e.g. Fergusson et al. 2003). The present study covered a 2-year period in middle adolescence. The relatively short follow-up may account for the non-realisation of failure model in the present study. On the other hand, developmental associations between depressive symptoms and antisocial behaviour may depend on the time when antisocial behaviour begins (Lewinsohn et al. 1995b), and failure experiences triggered by antisocial behaviour may be age-related and differ
across developmental stages (Wiesner 2003). The present results suggest that the failure model is not adequate in middle adolescence (IV).

The present study demonstrated that self-reported depressive symptoms predicted subsequent antisocial behaviour in a 2-year span, but the acting out model held true only among females (IV). The acting out model has previously been supported by some studies (e.g. Kovacs et al. 1988, Loeber et al. 1994). In contrast to the finding for females, a history of depressive symptoms seemed to protect males against subsequent antisocial behaviour (IV), which concurs with the findings of Leadbeater et al. (1999) and Vermeiren et al. (2002b). Although the precise mechanism underlying this effect remains to be identified, it has been supposed that subsequent antisocial behaviour may be reduced due to the apathy and diminished energy associated with depression or that depressive symptoms and experiences of guilt/shame may indicate the potential for reflecting on one’s actions and their consequences for others (Vermeiren et al. 2002b).

Gender comparisons in longitudinal associations between depression and antisocial behaviour have so far been relatively uncommon. Regarding the acting out model (IV), there are at least two possible explanations. Firstly, the developmental course of antisocial behaviour seems to differ by sex, as boys generally begin antisocial behaviour earlier than girls do (Silverthorn and Frick 1999). Therefore, the longitudinal association between depressive symptoms and antisocial behaviour may emerge earlier among boys and be non-apparent in middle adolescence. Secondly, there is some evidence that acting out depression is likely to be associated especially with a family history of depression rather than a family history of antisocial behaviour, as in the case of the failure model (Karnik et al. 2006), and that females are more vulnerable to parental depression than males (Crawford et al. 2001). Obviously, because the evidence supporting this model is limited, and because the present study did not investigate gender differences in risk factors for depressive symptoms, the proposed mechanism needs to be verified in future research.

6.6 Limitations of the study

A major limitation of the present study is the lack of diagnostic interviews and lack of additional information (e.g. police records) as both depressive symptoms and antisocial behaviour were measured by self-report scales. Exclusive reliance on self-reports may have influenced the results.
However, the measures used in this study are widely used in depression and antisocial behaviour research and have demonstrated good psychometric properties and ability to predict DSM diagnosis (Beck et al. 1974, Achenbach 1991, Junger-Tas 1994b, Bennett et al. 1997, Kaltiala-Heino et al. 1999b, Morgan and Cauce 1999, Helstelä and Sourander 2001, Fountoulakis et al. 2003). In addition, because hidden criminality is estimated to be considerable, and official statistics cover only a small fraction of all antisocial behaviour, self-report methods offer more extensive picture of the whole phenomenon. In addition to this, anonymous responses, as in Studies I and II, are considered to increase reliability in the assessment of antisocial behaviour (Kivivuori 2005a). Lastly, self-report methods provide valuable information on adolescents’ subjective perceptions of their own well-being and behaviour.

Another limitation in data collection was that different versions of the RBDI were used in Studies I and II (12 items) vs. III and IV (13 items). Moreover, as the RBDI measures depressive symptoms at a given point in time (today), the duration of symptoms or the number of depressive episodes could not be assessed. It can therefore only be assumed that adolescents reporting depressive symptoms had been also depressed during the assessment of antisocial behaviour. In the light of earlier studies this assumption is likely to be valid, as adolescent depression tends to be persistent (e.g. Rutter et al. 2006). However, as the follow-up period in Study IV was relatively short, more research on the long-term course of depressive symptoms and antisocial behaviour and on longitudinal associations between disorders is needed.

It is also important to acknowledge that due to the cross-sectional study design in Studies I, II and III, no firm conclusions about causality between self-reported depressive symptoms and antisocial behaviour could be drawn from these samples. However, these findings also indicate a robust association between depressive symptoms and antisocial behaviour.

Because those adolescents who were absent from school on the survey day were not contacted in Studies I and II, it is possible that the rates of self-reported depressive symptoms and delinquent behaviour may have been underestimated given that those adolescents may be more depressed and behave more delinquently than other pupils. A further limitation is that the response rate in the 2-year follow-up sample (IV) was modest. Given that study dropouts are more likely to have psychiatric disorders than those attending the study (Oldenhinkel et al. 1999), and only limited information about non-participants was available at follow-up, the results may not be generalizable. Similarly, given that both depression and antisocial behaviour reportedly have considerable
continuity in adolescence (e.g. Rutter et al. 2006), the rates of self-reported depressive symptoms and antisocial behaviour may also be underestimated at follow-up. However, the associations found between these disorders are not likely to be affected by non-participants. A further limitation in the follow-up sample is that in studying homotypic continuity of antisocial behaviour no distinction was made between adolescents with violent antisocial behaviour vs. adolescents with non-violent antisocial behaviour. Reportedly, this differentiation would have been valid as violence and persistent delinquency are strongly associated (Rutter et al. 1998, p. 105).

Because of the anonymous responses in Studies I and II, no attrition analysis was conducted. In Study III attrition analysis was not conducted as only very limited information (age) about non-participants at baseline assessment was available. In Study IV attrition analysis was conducted. Finally, the results from Studies III and IV may not be representative of the whole Finnish adolescent population since none of these adolescents came from rural areas.

6.7 Strengths of the study

Most of the studies investigating comorbidity between depression and antisocial behaviour have been conducted in the United States or in the UK, and many of them have been conducted among referred or institutionalized male adolescents, which impairs the generalizability of the results. The key strength of the current study is that a large number of females and males made it possible to study gender differences. This is important, because although studies on antisocial behaviour based on female samples have increased in past years, there is still relatively little psychiatric research on antisocial females (Maughan and Rutter 2001). Similarly, the use of a community samples enables the extension of previous findings conducted in more selective populations into general adolescent population in Nordic countries. Regarding longitudinal associations between self-reported depressive symptoms and antisocial behaviour, the large longitudinal sample made it possible to test two models simultaneously. Most of the studies so far have focused on only one developmental model.

The sample of Studies I and II were geographically representative of Finnish adolescent population as they consisted different sized urban and rural municipalities representing adolescents from different living environments. Lastly, the response rate in Studies I, II and III was excellent.
7. CONCLUSIONS

Based on the results of this study the following conclusions can be drawn.

1. Social support from family is essential in buffering adolescents against depressive symptoms and antisocial behaviour.
2. Depressive symptoms and antisocial behaviour have a considerable continuity in middle adolescence in both sexes. The finding emphasizes the importance of the prevention, early identification and efficient treatment of disorders.
3. Adolescents with antisocial behaviour are more likely to be depressed than non-antisocial adolescents. The finding of comorbidity between depressive symptoms and antisocial behaviour previously found mainly among institutionalized males was confirmed in the current study on males and females from a general school population. The finding is important, given that adolescents with co-occurring depressive symptoms and antisocial behaviour are at increased risk for diverse psychosocial impairments both in later adolescence and in adulthood.
4. The risk for depressive symptoms varies and increases according to the types and the frequencies of delinquent behaviour. Among females the strongest association is in frequent vandalism and among males in frequent violence.
5. Depressive symptoms differentiate patterns of delinquent behaviour. Delinquent behaviour in depressed adolescents is more versatile than in non-depressed adolescents. The finding is worrying, given that versatile antisocial behaviour is associated with the poorest outcome.
6. The course of antisocial behaviour is altered by the presence of depressive symptoms. Depressed females are at risk of subsequent antisocial behaviour. Former depressive symptoms protect males from subsequent antisocial behaviour.

8. CLINICAL IMPLICATIONS

The findings of this study have many implications for both the prevention and treatment of both depressive symptoms and antisocial behaviour. Firstly, the early identification of those adolescents with decreased social support is crucial to prevent depressive symptoms and antisocial behaviour.
Because social support from family seems to be especially important in preventing both depressive symptoms and antisocial behaviour, it is important to identify families at risk and provide them with adequate support. Secondly, based on the earlier research it is already well acknowledged that both depression and antisocial behaviour have considerable continuity in adolescence, but besides this, the present study detected no significant gender differences either in the continuity of depressive symptoms or in the continuity of antisocial behaviour. Thus, the findings indicate that once they have emerged, depressive symptoms and antisocial behaviour are at least as persistent in both sexes. Therefore, targeted interventions should be initiated as soon as possible before the psychosocial adjustment of later adolescence and adulthood is impaired.

Thirdly, given that concurrent comorbidity between depressive symptoms and antisocial behaviour was also remarkable in a general school population sample, it is crucial that adolescents presenting with one of these disorders are carefully assessed also for the presence of the other disorder. Health care professionals have a special challenge in recognizing these multiproblem adolescents. Identification of comorbid antisocial behaviour may be difficult if attention is paid solely to externalizing symptoms. Efficient collaboration between parents, teachers, social workers and police is pivotal in detecting and in treating antisocially behaving adolescents. Special attention should be paid to those adolescents who repeatedly behave delinquently because they are at considerable risk for depressive symptoms.

Fourthly, the findings that depressive symptoms differentiate patterns of delinquent behaviour have implications for planning crime-prevention programmes, in developing treatment programmes for repeatedly delinquently behaving adolescents and in detecting depressive symptoms among delinquent adolescents. The risk for depressive symptoms increases as a function of increased delinquent behaviour. Other potential warningsigns for depressive symptoms are versatile delinquent behaviour and specialization in violence among males and vandalism among females.

Finally, the course of antisocial behaviour is altered by the presence of depressive symptoms. The finding that depressive symptoms precede antisocial behaviour among females indicates that to prevent antisocial behaviour, interventions should not focus solely on antisocial behaviour, but also on depressive symptoms.
9. RESEARCH IMPLICATIONS

While depressive symptoms and antisocial behaviour were associated in a significant and robust manner in the current study, it is noteworthy that some of the antisocially behaving adolescents were not depressed. It seems that some adolescents behave antisocially without becoming depressed, and behave antisocially for other reasons than acting out depression. In the future, further research will be needed on how depressed and non-depressed antisocially behaving adolescents differ from one other in terms of social and psychosocial background factors and antisocial causation (e.g. shared risk factors).

Little is known about how adolescent depression is associated with the various forms of antisocial behaviour. This study indicated that repeat delinquency was far more common among depressed adolescents than among their non-depressed counterparts, but the reason for the exception that repeat shoplifting was more common among non-depressed girls needs further study. Similarly, more research is needed on why depressive symptoms did not differentiate specialization in violent offences among females as it did among males. The finding indicating that delinquent behaviour in depressed adolescents was more versatile than in non-depressed adolescents was new. Replication of the findings and further research on the exact mechanisms are needed.

There are only few studies focusing on the developmental associations between depression and antisocial behaviour in general adolescent population, gender comparisons are scarce, and need further study. Although studies on antisocial behaviour based on female samples have increased in past years, there is still relatively little psychiatric research on antisocial females. This study yielded evidence for the acting out model among females, but more research is needed to identify the precise mechanism underlying the finding that a history of depressive symptoms protected males from subsequent antisocial behaviour. Similarly, another important aim for future studies will be to ascertain why this protective effect of depressive symptoms did not operate among females. Finally, as the present results of longitudinal associations were based on a period in middle adolescence, it would be interesting to investigate whether depressive symptoms also predict antisocial behaviour in adulthood and whether the gender differences detected persist.
10. ACKNOWLEDGEMENTS

This study was carried out at the University of Tampere, School of Public Health and Tampere University Hospital, Department of Adolescent Psychiatry. Financial support was received from the Competitive Research Funding of the Pirkanmaa Hospital District, from the Yrjö Jahnsson Foundation and from the Finnish Cultural Foundation.

I owe my sincere gratitude to Adjunct Professor Riittakerttu Kaltiala-Heino for supervising this study and for teaching me psychiatric research. Ever since my master’s thesis, our cooperation has been inspiring and equal. Without her patient guidance and encouragement this study would never have been completed.

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I wish to express my profound gratitude to the official reviewers of this study, Adjunct Professor Kirsi Suominen and Professor Pirkko Räsänen, for their careful review and constructive comments which helped me to improve the final version of the study.

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Tampere, 2008

Minna Ritakallio
11. REFERENCES


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12. ORIGINAL PUBLICATIONS
Brief report: Delinquent behaviour and depression in middle adolescence: a Finnish community sample

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Abstract

A large number (N 50,569) of 14–16 year old Finnish adolescents taking part in the School Health Promotion Study were surveyed for delinquent behaviour in relation to depression. The results indicate a robust association between delinquency and depression. Among girls risk for depression varied between 1.3 and 3.1 according to various antisocial behaviours (the equivalent risk among boys was 1.3–2.5). Depression increased according to the frequency of delinquent behaviour. The results emphasize the importance of comprehensive clinical assessment and treatment of delinquent adolescents.

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Introduction

The association between delinquent behaviour and depression is well established among sentenced or incarcerated adolescents. These studies have shown a high prevalence of major
depression (10–30%). Depression is more prevalent among delinquent girls than boys. (Duclos, Beals, Novins, Martin, Jewett, & Manson, 1998; Ulzen & Hamilton, 1998; Teplin, Abram, McClelland, Duclan, & Mericle, 2002) Only a minority of adolescents behaving delinquently are convicted or incarcerated (Rutter, Giller, & Hagell, 1998). In a Finnish study 10% of those adolescents who reported that they had stolen or beaten up someone in the past year, were caught by the police (Kivivuori, 2002). Thus as the group of incarcerated adolescents represents only part of all delinquent adolescents, there is a need for studies conducted in general population.

Few studies have investigated the relationship between delinquent behaviour and depression in a general adolescent population. These studies have suggested increased risk of depression among delinquent adolescents (Loeber, Stouthamer-Loeber, & White, 1999; Vermeiren, 2002). Most of these studies have been conducted in the United States, in Europe only a few studies have focused on the relationship between delinquency and depression in community samples. Because cultural and social differences may influence the association between delinquency and depression, it is essential to assess this relationship in different countries.

The purpose of current study was to investigate the relationship between self-reported delinquent behaviour and depression in a large community-based middle-adolescence sample.

Methods

The subjects of the study were adolescents aged 14–16 years who participated in 2002 in the School Health Promotion Study. The survey was conducted in three of the six administrative divisions in Finland. These areas include urban and rural municipalities of different sizes; thus the data of the current study is a very representative sample of Finnish adolescents. The survey was completed anonymously during a school lesson (8th and 9th grades) under the supervision of teachers. 53,524 adolescents (81% of the pupils) responded to the survey. 2955 of the responses (5.5% of the respondents) were excluded from the study because of the incomplete responses on the depression scale. Thus the final sample for the present study was 50,569 adolescents (50.1% boys). Respondents’ mean age was 15.3 years (std 0.6).

Depression was assessed by a Finnish modification of the short version of Beck Depression Inventory (R-BDI) (Beck & Beck, 1972; Raitasalo, 1995). R-BDI is a self-reported instrument measuring the intensiveness of depressive symptoms. Originally R-BDI contains 13 items, but in the current study one item concerning suicidal ideation was excluded because the Finnish Ministry of Education decided not to allow the use of this item for fear that asking about suicidality might provoke it in adolescents. Each of remaining twelve item was scored 0–3 according to the intensiveness of the symptom. Sum scores of depression were dichotomised to none/mild depression (0–7) and moderate/severe depression (8–36) (Beck & Beck, 1972).

Involvement in delinquent behaviour was measured by six different forms of delinquent behaviour by asking regarding each the question “During the past twelve months have you written/drawn graffiti on walls, buses, bus shelters, windows or other similar places (similarly: deliberately damaged or destroyed the property of the school or the school building/deliberately damaged or destroyed the property of other public places than school/stolen something from shops or from stalls/taken part in a fight/beaten someone up)? Response categories were “never”, “once to four times” and “five times or more”. The preliminary analysis revealed that the two
vandalism variables and similarly the two violent behaviour variables greatly overlap. Therefore the two questions about vandalism were combined into one variable (vandalism), and the two questions about violent behaviour were combined into one (violent behaviour).

Age, sex, family structure, parental educational level, parental unemployment during the past year, years of living in the same municipality and degree of urbanization of place of residence were investigated as the sociodemographic variables.

Data was analysed by logistic regression in which delinquent behaviours were entered simultaneously as independent variables and depression as dependent variable. Sociodemographic variables and age were controlled. Analyses were conducted separately for boys and girls using SPSS for Windows version 11.0.

Results

Of the boys 7.5% (1899/25352) and of the girls 15.7% (3960/25217) reported symptoms indicating to moderate or severe depression (p<0.001). All the studied delinquent behaviours were independently associated with depression in both sexes after controlling for age and sociodemographic factors (Table 1). Among girls risk for depression varied between 1.3 and 3.1 according to various antisocial behaviours (the equivalent risk among boys was 1.3–2.5). The strongest associations with depression were detected for frequent vandalism and violent behaviour. Depression increased according to the frequency of delinquent behaviour in both sexes. In addition to delinquent behaviour, depression was associated in both sexes with living apart from parents, low parental education level, unemployment of both parents and living in the area for less than 1 year.

Discussion

The present study confirmed on the general population level the association between delinquent behaviour and depression previously found in incarcerated adolescents. Depression was the more common the more frequently the adolescent had been involved in the delinquent acts studied, but it is worth noting that the risk of depression was increased even when there had been one single offence.

The association between antisocial behaviour and depression is a complex phenomenon and there are conflicting opinions on the causal relationship between these features. Delinquent behaviour can be considered a result of depression so that delinquency is one form of acting out, or depression can be considered a consequence of criminal behaviour. It has been suggested that depression among incarcerated adolescents may be associated with the incarceration and not with delinquency per se (Vermeiren, De Clippele, & Deboutte, 2000), but the present results cannot be explained by this.

Some limitations of the present study must be conceded. Depression was evaluated with a self-reported questionnaire (R-BDI). Although the R-BDI is not a diagnostic instrument, its quality as a screening method in assessing depressive symptoms has been proved good. (Bennett, Ambrosini, Bianchi, Barnett, Metz, & Rabinovich, 1997). Adolescents who score moderately or severely
Table 1
Risk of depression [Odds ratio (OR), 99% confidence interval (CI)] according to delinquent behaviour among 14- to 16-year-old Finnish adolescents by sex when age and sociodemographic factors are controlled for

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th></th>
<th>Boys</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>OR CI 99%</td>
<td></td>
<td>OR CI 99%</td>
<td></td>
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<tr>
<td><strong>Graffiti writing/drawing</strong></td>
<td></td>
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<tr>
<td>No</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Once to four times</td>
<td>1.5</td>
<td>1.3–1.7</td>
<td>1.3</td>
<td>1.1–1.6</td>
</tr>
<tr>
<td>Five or more times</td>
<td>1.5</td>
<td>1.1–2.1</td>
<td>1.8</td>
<td>1.3–2.3</td>
</tr>
<tr>
<td><strong>Shoplifting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Once to four times</td>
<td>1.3</td>
<td>1.1–1.5</td>
<td>1.2</td>
<td>1.0–1.5</td>
</tr>
<tr>
<td>Five or more times</td>
<td>1.4</td>
<td>1.1–1.7</td>
<td>1.2</td>
<td>1.0–1.7</td>
</tr>
<tr>
<td><strong>Vandalism</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
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<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Once to four times</td>
<td>1.6</td>
<td>1.4–1.9</td>
<td>1.5</td>
<td>1.3–1.8</td>
</tr>
<tr>
<td>Five or more times</td>
<td>3.1</td>
<td>2.2–4.5</td>
<td>2.3</td>
<td>1.7–3.1</td>
</tr>
<tr>
<td><strong>Violent behaviour</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Once to four times</td>
<td>1.8</td>
<td>1.5–2.1</td>
<td>1.3</td>
<td>1.1–1.6</td>
</tr>
<tr>
<td>Five or more times</td>
<td>1.9</td>
<td>1.4–2.8</td>
<td>2.5</td>
<td>2.0–3.2</td>
</tr>
<tr>
<td><strong>Family structure</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Nuclear family</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Step-parent family</td>
<td>1.3</td>
<td>1.1–1.5</td>
<td>1.4</td>
<td>1.1–1.7</td>
</tr>
<tr>
<td>Single-parent family</td>
<td>1.2</td>
<td>1.1–1.4</td>
<td>1.3</td>
<td>1.1–1.6</td>
</tr>
<tr>
<td>Living apart from parents</td>
<td>1.7</td>
<td>1.0–2.6</td>
<td>2.4</td>
<td>1.4–3.7</td>
</tr>
<tr>
<td><strong>Parental education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Vocational</td>
<td>1.1</td>
<td>1.0–1.2</td>
<td>1.0</td>
<td>0.8–1.1</td>
</tr>
<tr>
<td>Basic school</td>
<td>1.4</td>
<td>1.1–1.7</td>
<td>1.5</td>
<td>1.2–1.9</td>
</tr>
<tr>
<td><strong>Parental unemployment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>One parent</td>
<td>1.3</td>
<td>1.2–1.5</td>
<td>1.3</td>
<td>1.1–1.5</td>
</tr>
<tr>
<td>Both parents</td>
<td>1.8</td>
<td>1.4–2.2</td>
<td>2.1</td>
<td>1.5–2.8</td>
</tr>
<tr>
<td><strong>Years living in the same area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 years or more</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>5–9 years</td>
<td>1.0</td>
<td>0.9–1.2</td>
<td>1.0</td>
<td>0.8–1.2</td>
</tr>
<tr>
<td>1–4 years</td>
<td>1.1</td>
<td>1.0–1.3</td>
<td>1.1</td>
<td>0.8–1.3</td>
</tr>
<tr>
<td>Under 1 year</td>
<td>1.5</td>
<td>1.2–2.0</td>
<td>1.8</td>
<td>1.3–2.5</td>
</tr>
<tr>
<td><strong>Degree of urbanization</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Semi-urban</td>
<td>0.9</td>
<td>0.8–1.1</td>
<td>0.9</td>
<td>0.7–1.1</td>
</tr>
<tr>
<td>Urban</td>
<td>1.0</td>
<td>0.8–1.1</td>
<td>1.0</td>
<td>0.8–1.2</td>
</tr>
</tbody>
</table>
depressed can be considered to be in need of clinical attention. The evaluation of delinquent behavior was also based on self-reported information. Although there are known limitations in the reliability of self-reported delinquency, such as dishonesty, self-report methods are generally considered valid methods in assessing delinquency. Because the hidden criminality is estimated to be substantial and official reports cover only a small fraction of all delinquency, self-report methods offer sufficient reliability for assessing delinquent behaviour (Rutter et al., 1998; Kivivuori, 2002).

The present study offers implications for both the prevention and treatment of depression and delinquent behaviour. Health care professionals have a special challenge in recognizing depression among delinquent adolescents. Special attention should be paid to those young people who repeatedly commit offences because they are at considerable risk of depression. Comprehensive clinical assessment and treatment of delinquent adolescents is needed. On the other hand, delinquent behaviour should be screened among depressed adolescents, to prevent marginalization.

References


Comorbidity between depression and antisocial behaviour in middle adolescence: the role of perceived social support

Authors: Minna Ritakallio, Tiina Luukkaala, Mauri Marttunen, Mirjami Pelkonen and Riittakerttu Kaltiala-Heino
Comorbidity between depression and antisocial behaviour in middle adolescence:
the role of perceived social support

Abstract

A sample of 3,278 students (aged 15 to 16 years) were surveyed to investigate the
interrelations between depression (RBDI; The Finnish modification of the 13-item Beck
Depression Inventory), antisocial behaviour (YSR; Youth Self-Report) and perceived
social support from family, friends and significant other (PSSS-R; The Perceived Social
Support Scale-Revised). The study aimed especially to control for the effect of
perceived social support in the comorbidity between depression and antisocial
behaviour. The results indicate firstly that decreased perceived social support was
associated with both depression and antisocial behaviour in both sexes. Similarly,
antisocial behaviour was associated with depression in both sexes. Perceived social
support modified comorbidity between depression and antisocial behaviour, but
antisocial behaviour still remained independently associated with depression. Thus,
perceived social support did not explain the found comorbidity between depression and
antisocial behaviour.

Key words: comorbidity, depression, antisocial behaviour, perceived social
support, adolescence
Comorbidity between depression and antisocial behaviour in middle adolescence: the role of perceived social support

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**Introduction**

Several studies have revealed that depression and antisocial behaviour associate in adolescence. Among sentenced or incarcerated adolescents the prevalence of major depression has ranged from 10% to 30% (1-3). Similarly, in community samples rates of comorbidity between depression and antisocial behaviour have ranged from 8% to 45% (4-7). In a recent community study the odds ratio (OR) for depression varied from 1.3 to 3.1 according to various forms of antisocial acts (8). Although antisocial behaviour itself is more common among boys than girls (9), depression is more prevalent among antisocial girls than antisocial boys (2-3). The risk for depression seems to increase in both sexes according to the frequency and severity of antisocial behaviour (10,8). However, the underlying mechanism of comorbidity between adolescent depression and antisocial behaviour are yet unclear. There are basically at least three possible models to consider. Antisocial behaviour can be considered to be a result of depression so that antisocial behaviour is one form of acting out or depression can be considered as a consequence of antisocial behaviour accompanied with social failure experiences. Thirdly, comorbidity between depression and antisocial behaviour may result from common or shared risk factors (11-15).

Lack of social support is associated with adolescent depression. Although the significance of the family as a support source decreases during the adolescent development, and also other forms of social support (e.g. social support from friends and teachers) are inversely related to depression, the social support from parents seems to have the most efficient effect in buffering adolescents against depression (16-20).
Some of the previous studies have found that girls are more vulnerable to decreased social support than boys in relation to depression (21,18), but others have found no gender differences in the association between emotional problems and decreased social support (22,20). In addition to depression, social support is associated also with antisocial behaviour. Previous studies have shown that antisocially behaving adolescents receive less social support and have more negative family relations than non-antisocial counterparts (23-26). As in the case of depression, it seems that particularly social support from parents buffers adolescents most efficiently against antisocial behaviour. According to the review of Deptula & Cohen (27) there are inconsistent results concerning psychological closeness of delinquents’ friendships. Some studies have found that antisocial adolescents receive less social support from their friends than non-antisocial adolescents, but others have not found any differences between these groups in the closeness of friend relations (27).

In sum, given that low social support is associated both with adolescent depression and antisocial behaviour, more detailed research on the role of social support in the comorbidity between depression and antisocial behaviour is indicated. Apparently, no previous study has investigated whether social support mediates the found comorbidity between depression and antisocial behaviour or is the comorbidity independent of social support. Therefore, the purpose of the current study was, firstly to investigate whether perceived social support from family, friends and significant other person are similarly associated with depression and with antisocial behaviour in middle adolescence. Secondly, the study aimed to control for the effect of perceived social support in the comorbidity between depression and antisocial behaviour in order to reveal whether the
comorbidity between disorders is independent of perceived social support. Finally, the study investigated whether the interrelations between depression, antisocial behaviour and perceived social support occur similarly in both sexes.

Materials and Methods

Study sample and procedures

The present study is a part of an ongoing prospective follow-up study Mental Health in Adolescence. Ninth grade students (aged 15-16 years) of all the Finnish-speaking secondary schools in two Finnish cities, Tampere (200 000 inhabitants) and Vantaa (180 000 inhabitants) completed a person-identifiable questionnaire during a school lesson supervised by a teacher. The subjects were identified in the school registers of the participating cities. The parents of the subjects were informed in advance by a letter, but parental consent to participation was not required since the Finnish legislation on medical research allows a 15-year-old subject to decide alone. The students received written information on the study and signed written informed consent forms before completing the questionnaires. The students returned the informed consent forms and the completed questionnaires in separate closed envelopes. For students absent from the school on the original survey day, a separate opportunity to participate was offered in the school within a couple of weeks of the original data collection. For students not present on either occasion, the questionnaires were sent by post. If there was no response after a second reminder, we concluded that the student was not willing to participate.
Pupils in the ninth grades of the participating schools totalled 3,809, of whom 3,597 responded (response rate 94.4%). Six respondents had to be excluded due to obvious facetiousness. Since it is possible for a person under 15 years to be attending the ninth grade, we later excluded respondents who were not yet 15 years old (n=313). Thus, the final sample consisted of 1609 girls and 1669 boys. The mean age was 15.5 (sd 0.39). Of the respondents 71% were living in two-parent families, 15% in single-parent families, 12% in stepparent families and 1% had some other legal guardian. There were no statistically significant differences between cities in the family structure variables.

Residential stability was high: 84% of the respondents had been living in the same municipality for at least five years and 67% had been living there at least nine years. 64% of the respondents had not moved even within the municipality for at least five years. Highest education of the father was primary/comprehensive in 18%, primary/comprehensive with vocational education in 39%, high school/high school with vocational education in 17% and college/university degree in 26% of the respondents. Highest education of the mother was primary/comprehensive in 15%, primary/comprehensive with vocational education in 31%, high school/high school with vocational education in 29% and college/university degree in 25% of the respondents. At least one of the parents had a college or university degree in 37% of the respondents. There were 242 (8%) families where both of the parents had completed primary or comprehensive education only. Low education of the parents was significantly more common in Vantaa. In 75% of the cases neither of the parents had been unemployed during the past year. Parental unemployment was significantly more common in Tampere (28%) than in Vantaa (23%). These sociodemographic variables resemble
those conducted previously from a large geographically representative sample of
Finnish adolescents (28-29).

Attrition analysis was not conducted as only very limited information (age) about non-
participants was available. Therefore it is possible that the rates of depression and
antisocial behaviour may have been underestimated given that non-responders may be
more depressed and behave more antisocially than other pupils.

Measures

A Finnish modification (RBDI, 30) of the 13-item Beck Depression Inventory (BDI, 31-
32) was used to assess depression. The 13-item BDI is a widely used self-report scale
measuring the severity of depressive symptoms (emotional, cognitive and physical), and
its reliability and validity are good (33). For example, Fountoulakis et al. (34) reported
that the 13-item BDI with cut-off point 8 predicted a SCAN-diagnosis of depression
with good sensitivity (0.93) and specificity (0.88). Further, the Finnish modification
(RBDI) has been shown to be an appropriate method for measuring depression in
Finnish adolescents (35-37). Each of the 13 items (e.g. “I am so sad or unhappy that I
can’t stand it” and “I can’t make any decisions at all anymore”) were scored 0 – 3
according to the severity of the symptom. Sum scores (range 0-39) were dichotomised
to none/mild depression (0- 7 scores) and moderate/severe depression (8-39 scores) as
recommended by Beck & Beck (31) and as has been done in the previous analyses of
Finnish adolescent samples (e.g. 20,8).
Antisocial behaviour was assessed by the externalizing scale of the Youth Self-Report (YSR, 38). YSR is based on self-reports from adolescents aged 11-18 years, and it is widely used in previous studies showing high reliability and validity (38-40). For example, Morgan & Cauce (41) found that high YSR scores on Externalizing scale predicted a DISC-C-diagnosis of oppositional defiant or conduct disorder with respectable rates of sensitivity (0.74) and specificity (0.73). In addition, recent epidemiological comparisons of the YSR in 24 countries revealed considerable consistency in adolescents’ self-reported problems (42).

The Externalizing scale consists of 11 variables concerning delinquency (e.g. “I lie or cheat”, “I run away from home”, “I steal at home”) and 18 variables concerning aggressive behaviour (e.g. “I am mean to others”, “I destroy things belonging to others”, “I physically attack people”) during the past 6 months. Each variable was scored 0-2 according to the frequency of antisocial behaviour. Sum scores of the 29 items (range 0-58) were dichotomised using the 90th percentile as cut-off into those within normal range versus those within clinical range. Because antisocial behaviour is more common among adolescent boys than girls, sex-specific cut-off-points (boys 24.0 and girls 25.0) were used (38).

Perceived social support was assessed by The Perceived Social Support Scale-Revised (PSSS-R). PSSS-R is presented by Blumenthal et al. (43), and measures persons’ subjective perceptions of social support and emotional closeness, not actual number of supportive contacts. It has been shown to be a useful method in assessing perceived social support in Finnish adolescents (44). PSSS-R contains 12 items on a five-point
Likert-type scale. Three factor-analytically derived sum scores (each ranging 4 to 20 scores) were used addressing perceived social support from family (4 items, e.g. “I get emotional help and support I need from my family”), from friends (4 items, e.g. “My friends really try to help me”) and from significant other (4 items, e.g. “There is a special person with whom I can share may joys and sorrows”). High sum scores indicate high perceived social support. PSSS-R was used as continuous variable in associations between perceived social support and depression and antisocial behaviour. In multivariable associations PSSS-R was used as categorical variable dichotomised according to 25th percentile into those with low level of perceived social support versus those with high level of perceived social support. This was done because the distributions of the perceived social support-scores were skew.

Sex, family structure (nuclear family, step-parent family, single-parent family or other custodian), parental education level (academic, vocational or basic level), parental unemployment during the past year (none, one parents or both parents) and years of living in the same municipality (9 years or more, 5-9 years, 1-4 years or less than 1 year) were investigated as sociodemographic variables. Parental educational level was classified as academic if at least one of the parents had an academic education, as vocational if at least one of the parents had some vocational training and as basic level if neither of the parents had not completed any vocational education. These variables were included as covariates because previous studies have shown them to associate with depression (6,20,45).
Statistical analysis

All analyses were conducted separately for boys and girls. Association between perceived social support and depression and association between perceived social support and antisocial behaviour were analysed by Mann-Whitney test, where all 3 types, of perceived social support (family, friends and significant other) were analyzed separately. Univariate associations between antisocial behaviour and depression was analysed by Pearson chi-square test and by logistic regression (Model 1). Multivariate associations between depression as a dependent variable and antisocial behaviour as independent variable were adjusted by family support, friend support and significant other support, which were entered separately into the models (Model 2, Model 3 and Model 4). In the model 5 three perceived social support types were entered simultaneously to investigate the association of the antisocial behaviour for depression. Finally family structure, parental education, parental unemployment and stability of living were added as covariates into the model to analyse the effect of potential confounding factors (Model 6). Statistical analyses were performed using SPSS for Windows, version 11.0. (SPSS Inc., Chigaco, IL, USA).

Results

Decreased perceived social support was associated with depression (Table 1). Both depressed boys and girls reported significantly less social support than non-depressed boys and girls. The difference in relation to perceived social support between depressed and non-depressed adolescents was present in all sources of social support (family,
friends and significant other), but the difference in the perceived social support was most evident in both sexes in the decreased social support from family.

All three types of perceived social support were inversely associated with antisocial behaviour among boys (Table 1). Antisocially behaving boys reported receiving less social support from family, friends and other significant person than non-antisocial boys. Among girls, only decreased perceived social support from family was associated with antisocial behaviour.

Antisocial behaviour was associated with depression in both sexes. Depression was far more common (p<0.001) among antisocial boys (25.3%) and girls (35.1%) than among non-antisocial boys (4.5%) and girls (11.1%). Antisocial boys were seven times more likely to be depressive than non-antisocial boys. Respectively, antisocial girls were four times more likely to be depressive than non-antisocial girls (Table 2, Model 1).

Adding perceived social support factors separately into the model modified differently the association between depression and antisocial behaviour. When the association between depression and antisocial behaviour was adjusted by perceived social support from family (Model 2), the association of the antisocial behaviour for depression decreased in both sexes compared to the unadjusted associations. Perceived social support from friends (Model 3) and perceived social support from significant other (Model 4) had an opposite effects on the association of the antisocial behaviour for
depression as social support adjusted associations were slightly higher in both sexes than the unadjusted associations. When all perceived social support factors were entered simultaneously into the model (Model 5), the associations of the antisocial behaviour for depression were OR 5.3 [95% CI 3.4-8.5] among boys and OR 3.2 [95% CI 2.1-4.7] among girls. Adding covariates (family structure, parental education level, parental unemployment during the past year and years of living in the same municipality) into the model (Model 6) did not remarkable alter associations between depression and antisocial behaviour (Table 2).

Insert Table 2 about here.

Discussion

Consistent with previous studies (e.g. 17) decreased perceived social support was associated with adolescent depression. Also in accord with previous studies (e.g. 16), social support from family seems to have the most efficient buffering effect in relation to depression. The finding of no gender differences in the associations between decreased social support and depression is in contrast to some previous studies (e.g. 44), but in accordance with others (e.g. 22). Perceived social support from family, friends and significant other were inversely associated with antisocial behaviour among boys. Among girls, only decreased perceived social support from family was associated with antisocial behaviour. The finding is similar to the study of Bru et al. (26) reporting that parental support was negatively associated with antisocial behaviour in both sexes, but lack of friend support was modestly associated with antisocial behaviour only among
boys. These results emphasise the role of parents and family in a socialisation process and as prosocial role models in preventing antisocial behaviour. Previous findings on psychological closeness of delinquents’ friendships have been mixed (27). In addition, little attention has been paid to the role of gender in the friendships of antisocial adolescents as many studies have focused exclusively on boys.

The main purpose of the present study was to control the effect of perceived social support in the comorbidity between depression and antisocial behaviour. Although associations between low social support and depression/antisocial behaviour are well established, apparently no previous study has focused on the interrelations of these phenomenons. The current study indicated that although perceived social support from family, friends and significant others modified the comorbidity between depression and antisocial behaviour, antisocial behaviour still remained independently associated with depression. In other words, decreased perceived social support did not explain the found comorbidity between depression and antisocial behaviour.

Different factors of perceived social support (family, friends and significant other) modified differently the comorbidity between depression and antisocial behaviour, but in all cases, antisocial behaviour still remained independently associated with depression. When taking account the perceived social support from family, the risk effect of antisocial behaviour for depression reduced in both sexes as decreased social support from family explained part of the depression. In contrast, adjusting by perceived social support from friends slightly strengthened the risk effect of antisocial behaviour for depression in both sexes. It seems that antisocial adolescents are even more
vulnerable to depression if they simultaneously lack support from friends. However, it may also be that depressed antisocially behaving adolescents push away offers of social support or that they do not realise that they actually have social support as a part of feeling of loneliness. On the other hand, the measure of social support used in this study measures explicitly adolescents’ subjective perceptions of social support and emotional closeness, not actual number of supportive contacts. Therefore, the adolescents’ subjective perceptions of decreased support are valuable. After controlling by all sources of perceived social support and the sociodemographic variables, depression was five times more common among antisocial boys and almost three times more common among antisocial girls than among non-antisocial counterparts. The finding is in accordance with previous studies suggesting increased risk of depression among antisocial adolescents (e.g. 8,10,46).

A major limitation of the current study is the lack of diagnostic interviews and lack of additional information (e.g. parents, teachers) as both depression and antisocial behaviour were measured by self-report scales (RBDI and YSR). Exclusive reliance on self-reports may have influenced the results. However, although RBDI is not a diagnostic instrument, it has been shown to be efficient and valid instrument in distinguishing between depressed and non-depressed adolescents (33, 36). Adolescents scoring moderate to severe on depressive continuum can be considered to be in need of clinical attention, and these depressive symptoms are likely to reach clinical levels over time (47). Similarly, although there are known limitations in the reliability of self-reported antisocial behaviour, such as dishonesty, forgetfulness and exaggeration, self-report methods are generally considered reliable and valid methods in assessing
antisocial behaviour (48). In addition to this, the instrument used has shown good reliability and validity in assessing antisocial behaviour (38-39). Finally, self-report methods give valuable information on adolescents’ subjective perceptions of their own well-being and behaviour.

Findings of the current study indicate a robust association between depression and antisocial behaviour. However, given that depressed adolescents may be more likely to accuse themselves of wrongdoing because of feelings of guilt and self-accusations related with depression, rates of antisocial behaviour may be overestimated. The study sample was a large school-based sample of Finnish adolescents, the response rate was high (94.4%), and thus representative sample of medium-sized Finnish cities. However, as none of adolescents came from rural areas, the results may not be representative of the whole Finnish population of adolescents. Although antisocial behaviour was independently associated with depression, due to the cross-sectional study design no firm conclusion of a causal relationship can be drawn. Nevertheless, results indicate that antisocial behaviour and depression associate independently of decreased perceived social support, and therefore health care professionals and other professionals working with adolescents have a special challenge in recognizing these multiproblem adolescents.

The current study offers implications for prevention and treatment of both depression and antisocial behaviour. The early identification of those adolescents with decreased perceived social support is central in preventing depression and antisocial behaviour. The results emphasize the role of the family as source of perceived social support, and
therefore it is important to identify families at risk and provide adequate support for them. Although perceived social support modified the comorbidity between depression and antisocial behaviour, antisocial behaviour still remained independently associated with depression and therefore comprehensive clinical assessment and treatment of antisocial adolescents should be considered.

Acknowledgments: The study was supported by Yrjö Jahnsson Foundation, Pirkanmaa Hospital District Research Fund and The Finnish Cultural Foundation.
References


Table 1. Perceived social support from family, friends and significant other according to depression and antisocial behaviour are shown by mean (standard deviation) separately for boys and girls. Differences between depression or antisocial behaviour groups are tested by Mann-Whitney test.

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Note: Due to the missing cases on the RBDI, YSR and PSSS-R, number of cases in the analyses differs from total sample.
Table 2. Risk for depression by antisocial behaviour in 15 year old boys and girls as unadjusted (Model 1), adjusted by the support from family (Model 2), by the support from friends (Model 3) and by support from significant other (Model 4). In the model 5 antisocial behaviour is adjusted by all the effect of perceived social support (family, friends and significant other) together. To the latest model (Model 6) was added also family structure, parental education level, parental unemployment during the past year and years of living in the same municipality. Logistic regression models were used, with results given as the odds ratios (OR) and 95% confidence intervals (CI). Reference group of depression is non-depressive.

<table>
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<th>Girls N</th>
<th>OR [95% CI]</th>
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<td>415 7.7 [4.4-13.3]</td>
<td>405 4.9 [3.5-6.8]</td>
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**Model 6**  
**Antisocial behaviour**

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**Family structure**

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<td>Single parent</td>
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<td>221 2.0 [1.2-3.1]</td>
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**Parental education level**

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<td>132 0.6 [0.3-1.5]</td>
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**Parental unemployment**

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<tr>
<td>Either mother or father</td>
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<td>340 1.6 [1.1-2.4]</td>
</tr>
<tr>
<td>Both of parents</td>
<td>38 2.5 [0.9-7.2]</td>
<td>37 2.3 [1.0-5.4]</td>
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**Living in same municipality**

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<th>970 1.0</th>
<th>983 1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Over 9 years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-9 years</td>
<td>241 1.1 [0.6-2.1]</td>
<td>231 1.1 [0.7-1.8]</td>
</tr>
<tr>
<td>1-4 years</td>
<td>190 1.2 [0.6-2.4]</td>
<td>162 1.0 [0.6-1.7]</td>
</tr>
<tr>
<td>Under 1 year</td>
<td>51 2.0 [0.8-4.9]</td>
<td>57 3.3 [1.6-6.6]</td>
</tr>
</tbody>
</table>

*s.o.= significant other

Note: Due to the missing cases on the RBDI, YSR and PSSS-R, number of cases in the analyses differs from total sample.
Continuity, comorbidity and longitudinal associations between depression and antisocial behaviour in middle adolescence: A 2-year prospective follow-up study

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Abstract

The study investigated continuity, comorbidity and longitudinal associations between depression Beck depression inventory (RBDI) and antisocial behaviour Youth self-report (YSR) in middle adolescence. Data were used from a community sample of 2070 adolescents who participated in a 2-year prospective follow-up study. The results indicate that both depression and antisocial behaviour had considerable continuity, and concurrent comorbidity between these disorders was strong. In contrast to several previous studies, antisocial behaviour did not predict subsequent depression, but conversely, depression predicted subsequent antisocial behaviour among girls. Among boys history of depression seemed to protect from subsequent antisocial behaviour. Gender differences in longitudinal associations are discussed.

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Introduction

Previous studies have established that both depression and antisocial behaviour in adolescence have considerable continuity (Fergusson, Lynskey, & Hoorwood, 1996; Kim et al., 2003; Wiesner, 2003). In a longitudinal study by Beyers and Loeber (2003) 6–35% of the variance of current depression was explained by prior depression, the corresponding variance predicting current delinquency was 25–34%. Similarly, Costello, Mustillo, Erkanli, Keeler, and Angold (2003) found that adolescents with a history of depression were four times more likely than those with no previous depression to have depression in the future. The corresponding odds ratio (OR) for antisocial behaviour among those with a history of antisocial behaviour was about 10. Girls showed more continuity of depression than boys, but no gender differences were found in the continuity of antisocial behaviour. In contrast, Ferdinand, Verhulst, and Wiznitzer (1995) found that continuity of both depression and antisocial behaviour did not differ by sex. According to Angold et al. (1999) and Costello et al. (2003) the stability described above represents homotypic continuity in which manifestations of the disorder in question change relatively little over time so that diagnosis remains the same at different assessments.

High rates of concurrent comorbidity of adolescent depression and antisocial behaviour have been well established in both clinical (Biederman, Faraone, Mick, & Lelon, 1995; Goodyer, Herbert, Secher, & Pearson, 1997; Grilo et al., 1996) and population-based samples (Beyers & Loeber, 2003; Fergusson & Woodward, 2002; Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998; Ritakallio, Kaltiala-Heino, Kivivuori, & Rimpelä, 2005; Vermeiren, Deboutte, Ruchkin, & Schwab-Stone, 2002). In a meta-analysis of community studies Angold et al. (1999) found that after controlling for other comorbidities, conduct disorder was about seven times more common in depressed than in non-depressed adolescents. Previous research on gender differences in comorbidity, however, is inconsistent as some studies have found that depression is more prevalent among antisocial girls than boys (Costello et al., 2003; Flannery et al., 2001) while others have found the opposite (Maughan, Rowe, Messer, Goodman, & Meltzer, 2004).

In studying developmental associations between depression and antisocial behaviour the concept of heterotypic continuity is pivotal. Heterotypic continuity refers to a continuous process in which one disorder generates manifestations of different forms over time or in which one disorder exposes adolescents to different disorders at different ages (Angold et al., 1999; Costello et al., 2003). There are at least three possible developmental models (acting out, failure and mutual influence model) to explain the heterotypic continuity between adolescent depression and antisocial behaviour. The models differ in whether they assume associations to be causal (one disorder creates an increased risk for the other) or non-causal (association based on non-specific risk factors) or disorders are reciprocally associated with each other (Caron & Rutter, 1991; Fergusson et al., 1996; Overbeek, Vollebergh, Meeus, Engels, & Luijpers, 2001; Wiesner, 2003).

The acting out model proposes that depressed adolescents act out internalising problems and depression is masked out by antisocial behaviour. This model assumes that depression precedes antisocial behaviour and the cross-lagged associations are unidirectional and causal (Capaldi, 1992; Overbeek et al., 2001). The failure model assumes that there is a causal, unidirectional association between antisocial behaviour and subsequent depression. Antisocial adolescents face many problems in social relations (e.g. rejection, lack of support, conflict with parents and
teachers), have low social competence and coping skills and problems in academic attainment which in turn lead to failure experiences which increases vulnerability for depression (Capaldi, 1992; Kiesner, 2002). According to the mutual influence model both depression and antisocial behaviour result from non-specific (shared or overlapping) risk factors, and disorders are also reciprocally reinforcing each other over time. This model assumes that the onset of one disorder increases vulnerability to the other and vice versa. Therefore, cross-lagged and bidirectional associations between disorders are possible (Overbeek et al., 2001). As the current study investigated prospective associations between depression and antisocial behaviour we focused on acting out and failure models.

There are surprisingly few studies of the longitudinal associations between depression and antisocial behaviour in adolescence, and the results appear inconsistent (Loeber et al., 2000). It should, however, be noted that due to differences in methodology (e.g. age range of the sample, sex ratio of the sample and period of follow-up), previous studies are difficult to compare. Most previous studies have focused on the transition from (late) childhood to early adolescence (e.g. Kiesner, 2002) or they have followed children through adolescence into adulthood (e.g. Roza, Hofstra, van der Ende, & Verhulst, 2003).

Many studies conducted in community samples propose that antisocial behaviour precedes the onset of depression and that the effect is unidirectional (Capaldi, 1992; Feehan, McGee, & Williams, 1993; Fergusson et al., 2003; Kiesner, 2002; Rohde, Lewinsohn, & Seeley, 1991). Different results from these have been reported by Loeber, Russe, Stouthamer-Loeber, and Lahey (1994) who found that depression in early adolescent boys was associated with escalation to more serious delinquency and a variety of delinquent behaviour, but Vermeiren, Schwab-Stone, Ruchkin, De Clippele, and Deboutte (2002) found depression to be protective against recidivism. Harrington, Fudge, Rutter, Pickles, and Hill (1991) found that rates of adult depression were lower in those who as adolescents had comorbid antisocial behaviour and depression than in those who had had pure antisocial behaviour or pure depression in adolescence. Furthermore, some studies found no heterotypic continuity between these disorders (Costello et al., 2003; Lewinsohn et al., 1994; Overbeek et al., 2001; Roza et al., 2003) while others suggest that depression and antisocial behaviour affect each other in a bidirectional way (Beyers and Loeber, 2003).

Studies on gender differences among the longitudinal associations between depression and antisocial behaviour in adolescence are relatively rare. The study by Wiesner (2003) found limited evidence that antisocial behaviour among boys preceded depression but not vice versa. Among girls a circular process was found as high level of antisocial behaviour preceded high level of depression, which in turn, preceded de-escalation of antisocial behaviour, which finally resulted in lower level of depression. In the study by Hofstra et al. (2002) antisocial behaviour in childhood and adolescence predicted only boys’ mood disorders in adulthood. Overbeek et al. (2001) found no gender differences, suggesting that there are no cross-lagged associations between depression and antisocial behaviour as homotypic continuity of disorders best explain the future course of depression and antisocial behaviour.

In sum, the findings of previous studies on comorbidity and longitudinal associations between adolescent depression and antisocial behaviour have been inconsistent, especially with regard to gender differences. Although there are a few studies which includes both boys and girls, gender comparisons are still relatively uncommon. Given that the rates of both adolescent depression and
antisocial behaviour and the course of these disorders differ among boys and girls (Maughan et al., 2004; Overbeek et al., 2001), it could be assumed that longitudinal associations between these disorders also differ between genders. Most previous studies have investigated longitudinal associations between adolescent depression and antisocial behaviour using only one developmental model as a theoretical framework. It would be interesting to simultaneously test different developmental models to explain the longitudinal association between depression and antisocial behaviour. Ascertaining the developmental associations between depression and antisocial behaviour might provide important information regarding the etiology and course of these disorders for use in prevention and treatment.

The purpose of the present study was to investigate continuity, comorbidity and longitudinal associations between depression and antisocial behaviour using data from a 2-year longitudinal study with adolescent boys and girls. In detail, the study investigated (1) how common homotypic continuity of depression and antisocial behaviour is during a 2-year follow-up in middle adolescence, (2) whether there is concurrent comorbidity between depression and antisocial behaviour at age 15 and at age 17, (3) which developmental model—the failure model or the acting out model would best explain the longitudinal associations between depression and antisocial behaviour during a 2-year follow-up, and (4) whether there are any significant sex differences in any of these themes.

Methods

Study samples and procedures

The present study is a part of an ongoing prospective cohort study, Mental Health in Adolescence, conducted in two Finnish cities; Tampere (200 000 inhabitants) and Vantaa (180 000 inhabitants). The present samples consist of surveys at two waves (T1 and T2) during a 2-year follow-up conducted during the academic year 2002–2003 (T1) and during the academic year 2004–2005 (T2).

At T1 data were collected by a school survey completed by the ninth graders in all the Finnish-speaking secondary schools in the two cities. The students were identified from school registers. A person-identifiable survey was completed during a school lesson under the supervision of a teacher. For students absent from school on the original survey day, another opportunity to participate was offered in the school within a couple of weeks. For students not present on either occasion the questionnaires were sent by post twice, after which it was concluded that the student was not willing to participate. The parents of the students were informed in advance by letter, but parental consent to participation was not required since the Finnish legislation on medical research allows a 15-year-old subject to decide alone. The procedure at T1 is described in detail in Ritakallio, Luukkaala, Marttunen, Pelkonen, and Kaltiala-Heino (submitted for publication).

At T1 the ninth graders of the participating schools totalled 3809, of whom 3597 responded to the survey (response rate 94.4% at T1). Six respondents were excluded due to obvious facetiousness, and 313 respondents were excluded as they were completed by adolescents under 15 years old. Thus, the initial sample at T1 was 3278 students of whom 1609 were girls (49.1%). The mean age at T1 was 15.5 (sd = 0.4).
Eligible participants at T2 data were students who had participated at T1. Multiple approaches were used to contact the adolescents at follow-up. School-based surveys like that at T1 were organised in upper secondary schools and vocational schools. Adolescents not reached through schools were contacted by postal survey. Finally, the same survey was offered by Internet to those who had not yet responded via their schools or by post.

The subjects of the present study were the 2070 adolescents who completed the survey both at T1 and at T2. The response rate of the final sample was 63.1% (2070/3278). Of the respondents 56.4% (1167) were girls. The mean age at T2 was 17.6 (sd 0.4). At T2 62.4% of the adolescents were living in intact families (boys 65.0% vs. girls 60.5%, \( p < 0.001 \)). Permanent employment of the parents was high at T2 as only 6.2% of parents (one or both) had been unemployed during the past year (no gender differences). Over 80% of the adolescents were full-time students at T2 (girls 89.6% vs. boys 82.0, \( p < 0.001 \)). 66.1% of the adolescents were studying at upper secondary school at T2 (girls 72.3% vs. boys 58.1%, \( p < 0.001 \)). Stability of residence was high as 93.3% of the adolescents had lived in the same municipality for more than 1 year (girls 93.6% vs. boys 92.8, \( p = 0.443 \)).

Measures

A Finnish modification (RBDI) (Raitasalo, 1995) of the 13-item Beck depression inventory (BDI) was used to assess depression (Beck & Beck, 1972; Beck, Rial, & Rickels, 1974). The brief BDI is a widely used self-report scale measuring the severity of depressive symptoms (emotional, cognitive and physical), and its reliability and validity are good (Bennett et al., 1997). The Finnish modification of the brief BDI has been shown to be an appropriate method for measuring depression in Finnish adolescents (Kaltiala-Heino, Rimpela, Rantanen, & Laippala, 1999). Each item is scored 0–3 according to the severity of the symptom. Sum scores of the 13 items (range 0–39 scores) were dichotomised to none/mild depression (0–7 scores) and moderate/severe depression (8–39 scores) as recommended by Beck and Beck (1972) and as has been done in the previous analyses of Finnish adolescent population samples (e.g. Kaltiala-Heino et al., 2001). Fountoulakis et al. (2003) reported that 13-item BDI with cut-off point 8 predicted a SCAN-diagnosis of depression with good sensitivity (0.93) and specificity (0.88).

Antisocial behaviour was assessed by the externalising scale of the Youth self-report (YSR). The YSR was developed by Achenbach (1991) for the assessment of psychopathology in adolescents aged 11–18 years. It is widely used and has shown high reliability and validity (Achenbach, 1991; Helstelä & Sourander, 2001). There is also evidence that YSR has good ability to predict DSM diagnosis. For example, Morgan and Cauce (1999) found that high YSR scores on externalising scale predicted a DISC-C-diagnosis of oppositional defiant or conduct disorder with respectable rates of sensitivity (0.74) and specificity (0.73). The externalising scale consists of 11 variables concerning delinquency and 18 variables concerning aggressive behaviour. Each variable was scored 0–2 according to the frequency of antisocial behaviour. Sum scores of the 29 items (range 0–58) were dichotomised using the 90th percentile as cut-off into those within normal range vs. those within clinical range. Because antisocial behaviour is more common among adolescent boys than girls, sex-specific cut-off-points were used (Achenbach, 1991). At T1 the cut-off-point was 23.0 for girls and 24.0 for boys, and at T2 21.0 for girls and 22.0 for boys.
Sex, family structure (intact vs. non-intact), parental education level (academic vs. non-academic), parental unemployment during the past year (no vs. none or both) and residential stability (living 10 or more vs. up to 9 years in the same municipality) at T1 were controlled for as sociodemographic variables. Parental education was classified according to the higher educated parent. Previous studies have shown these variables to be associated with both depression and antisocial behaviour (Fröjd, Marttunen, Pelkonen, von der Pahlen, & Kaltiala-Heino, 2006; Kaltiala-Heino et al., 2001; Loeber et al., 1998).

Drop out

Non-participants at T2 were more likely to be boys (63.4% vs. girls 36.6%, \( p < 0.001 \)) living more frequently with both parents (35.2%) than those adolescents who participated in both surveys (27.5%, \( p < 0.001 \)). Adolescents who dropped out of the second survey were more likely to be depressed (11.7%) at baseline than those who participated in both surveys (9.1%) (\( p = 0.020 \)). Dropouts were also more likely to have displayed antisocial behaviour at baseline (12.3%) than participants (8.7%) (\( p < 0.001 \)).

Statistical analyses

All analyses were conducted separately for boys and girls. Homotypic continuity of depression was first studied by calculating proportions of those reporting depression at T2 according to depression at T1. The significance of differences in proportions was analysed by \( \chi^2 \)-test. Logistic regression analysis was performed to control for confounding by sociodemographic variables (family structure, parental education level, parental unemployment during the past year and residential stability). Depression at T2 was entered as a dependent variable, and in the first step depression at T1 was entered alone as an independent variable (basic model). Finally, all sociodemographic variables were added as independent variables. To ascertain if there were significant sex differences in homotypic continuity of depression, interaction terms for sex and depression at T1 were added into the basic model. Homotypic continuity of antisocial behaviour was analysed by similar procedures as homotypic continuity of depression.

Concurrent comorbidity between depression and antisocial behaviour was analysed both at T1 and at T2. Analyses were performed similarly at both waves. The proportions of those reporting depression by antisocial behaviour were calculated and the significance of differences in proportions was analysed by \( \chi^2 \)-test. Similarly, the proportions of those reporting antisocial behaviour by depression were calculated and the significance of differences was analysed by \( \chi^2 \)-test. Next, OR with 95% confidence interval (CI) for comorbidity between antisocial behaviour (dependent variable) and depression (independent variable) was calculated by logistic regression analysis. To ascertain, if there were significant sex differences in comorbidity, interaction terms for sex and depression (independent variable) were added into the model.

To test whether the failure model would explain longitudinal associations between depression and antisocial behaviour, the proportions of those reporting depression at T2 were calculated according to antisocial behaviour at T1. The significance of differences between groups was
analysed using $\chi^2$-test. Next, crude OR (OR, 95% CI) for depression at T2 (dependent variable) according to antisocial behaviour at T1 (independent variable) was calculated using logistic regression analysis (Model 1). Subsequently, OR for depression at T2 by antisocial behaviour at T1 was adjusted for depression at T1 (Model 2) and finally also for sociodemographic variables (family structure, parental education level, parental unemployment during the past year and residential stability) (Model 3).

To test the acting out model in explaining longitudinal associations between depression and antisocial behaviour, the proportions those reporting antisocial behaviour at T2 were calculated according to depression at T1. The significance of differences between groups was studied by $\chi^2$-test. Next, crude OR (OR, 95% CI) for antisocial behaviour at T2 (dependent variable) according to depression at T1 (independent variable) was calculated using logistic regression analysis (Model 1). Subsequently, OR for antisocial behaviour at T2 by depression at T1 was adjusted for antisocial behaviour at T1 (Model 2), and finally also for sociodemographic variables (family structure, parental education level, parental unemployment during the past year and residential stability) (Model 3).

Statistical analyses were performed with the SPSS 13.0 software package.

Results

Homotypic continuity

Both depression and antisocial behaviour showed considerable continuity during the 2-year follow-up in both sexes (Tables 1 and 2). Of the boys depressed at T1, 27.8% of them were also depressed at T2. Of the girls depressed at T1, 46.3% of them were also depressed at T2. Boys with depression at T1 had a 7.4-fold risk for depression at T2 after adjustment for sociodemographic variables. The corresponding OR for girls was 12.5. There were no significant gender differences in continuity of depression according to the interaction analysis ($p = 0.108$). Of the boys and girls reporting antisocial behaviour at T1, 43.5% of boys and 42.0% of girls still displayed antisocial behaviour at T2. Boys with antisocial behaviour at T1 had a 14.6-fold risk for antisocial behaviour at T2 after adjustment for sociodemographic variables. The corresponding OR for girls was 8.3. There were no significant gender differences in continuity of antisocial behaviour according to the interaction analysis ($p = 0.342$).

Concurrent comorbidity at T1 and T2

Concurrent comorbidity between depression and antisocial behaviour was high both at T1 and at T2 (Table 3). Girls with antisocial behaviour at T1 were three times more likely to be depressed than non-antisocial girls (OR 3.5, CI 2.3–5.5). Corresponding risk at T2 was OR 5.1 (CI 3.3–7.9). Similarly, boys with antisocial behaviour at T1 were seven times more likely to be depressed than non-antisocial boys (OR 7.3, CI 4.0–13.2). Corresponding risk at T2 was OR 5.5 (CI 3.1–10.1). There were no significant gender differences in comorbidity at T2 ($p = 0.836$) although comorbidity at T1 almost reached statistical significance ($p = 0.055$), suggesting that comorbidity may be more common among boys.
Table 1
Rates of [% (n)] and risk for [odds ratio (OR), 95% confidence interval (CI)] depression at 2-year follow-up (T2) according to depression at 15-year-old (T1) adolescents

<table>
<thead>
<tr>
<th></th>
<th>% (n)</th>
<th>Model 1a</th>
<th>95% CI</th>
<th>Model 2b</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
<td>OR</td>
<td>95% CI</td>
<td></td>
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<tr>
<td><strong>Boys at T1 (n)</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Depression</td>
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<td></td>
</tr>
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<td>7.5</td>
<td>3.8–14.6</td>
<td>Ref.</td>
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<td>27.8 (15)</td>
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<td>Family structure</td>
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<tr>
<td>Intact</td>
<td>#</td>
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<tr>
<td>Non-intact</td>
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<td>One or both</td>
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<tr>
<td>Residential stability</td>
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<tr>
<td>Over 10 years</td>
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<tr>
<td>Less than 9 years</td>
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<tr>
<td><strong>Girls at T1 (n)</strong></td>
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<tr>
<td>Depression</td>
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<tr>
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<td>14.4</td>
<td>9.3–22.1</td>
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<td>No</td>
<td>#</td>
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<tr>
<td>One or both</td>
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<td>Residential stability</td>
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<td>Less than 9 years</td>
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</tbody>
</table>

Ref. = reference group in logistic regression analysis and # = variable not in the model.

*Differences between non-depressed and depressed adolescents are significant (p<0.001) in χ²-test.

aIn Model 1, crude OR are presented.

bIn Model 2, OR are adjusted for sociodemographic variables (family structure, parental education level, parental unemployment during the past year and residential stability).
Table 2
Rates of [% (n)] and risk for [odds ratio (OR), 95% confidence interval (CI)] antisocial behaviour at 2-year follow-up (T2) according to antisocial behaviour at 15-year-old (T1) adolescents

<table>
<thead>
<tr>
<th></th>
<th>% (n)</th>
<th>Model 1&lt;sup&gt;a&lt;/sup&gt; OR (95% CI)</th>
<th>Model 2&lt;sup&gt;b&lt;/sup&gt; OR (95% CI)</th>
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<tbody>
<tr>
<td><strong>Boys at T1 (n)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Antisocial</td>
<td>6.3 (50)&lt;sup&gt;*&lt;/sup&gt;</td>
<td>Ref.</td>
<td>Ref.</td>
</tr>
<tr>
<td>No (794)</td>
<td>43.5 (40)</td>
<td>11.4 (6.9–18.9)</td>
<td>14.6 (8.3–25.6)</td>
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<td>Intact</td>
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<tr>
<td>Non-intact</td>
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<tr>
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<tr>
<td>Non-academic</td>
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<tr>
<td>Parental unemployment</td>
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<tr>
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<td>Residential stability</td>
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<td>Over 10 years</td>
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<tr>
<td>Less than 9 years</td>
<td></td>
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<td></td>
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<tr>
<td><strong>Girls at T1 (n)</strong></td>
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</tr>
<tr>
<td>Antisocial</td>
<td>8.0 (82)&lt;sup&gt;*&lt;/sup&gt;</td>
<td>Ref.</td>
<td>Ref.</td>
</tr>
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<td>No (1028)</td>
<td>42.0 (55)</td>
<td>8.3 (5.5–12.6)</td>
<td>8.3 (5.4–12.9)</td>
</tr>
<tr>
<td>Yes (131)</td>
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<tr>
<td>Family structure</td>
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<tr>
<td>Non-intact</td>
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<tr>
<td>Parental education level</td>
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<td>One or both</td>
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<tr>
<td>Residential stability</td>
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<td>Over 10 years</td>
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<tr>
<td>Less than 9 years</td>
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</tbody>
</table>

Ref. = reference group in logistic regression analysis and # = variable not in the model.

<sup>*</sup>Differences between non-antisocial and antisocial adolescents are significant ($p < 0.001$) in $\chi^2$-test.

<sup>a</sup>In Model 1, crude OR are presented.

<sup>b</sup>In Model 2, OR are adjusted for sociodemographic variables (family structure, parental education level, parental unemployment during the past year and residential stability).
Longitudinal associations between adolescent depression and antisocial behaviour

Failure model

Of those boys with antisocial behaviour at T1, 12.1% (11/91) were depressed at T2 (vs. 5.8% (46/796) of non-antisocial boys at T1) \( (p = 0.020) \). Correspondingly, of those girls with antisocial behaviour at T1, 16.0% (21/131) were depressed at T2 (vs. 9.6% (99/1029) of non-antisocial girls at T1) \( (p = 0.023) \). Antisocial behaviour at T1 predicted depression at T2 in both sexes when entered alone in logistic regression analysis (Table 4; Model 1). Adolescents with antisocial behaviour at T1 were approximately two times more likely to be depressed at T2 than those adolescents with no antisocial behaviour at T1. When depression at T1 and sociodemographic variables were controlled for (Table 4; Models 2 and 3), the association between antisocial behaviour at T1 and depression at T2 lost significance in both sexes.

Acting out model

Of boys depressed at T1, 14.8% (8/54) displayed antisocial behaviour at T2 (vs. 9.8% (82/834) of non-depressed boys at T1, \( p = 0.240 \)). Similarly, of girls depressed at T1, 26.9% (36/134) displayed antisocial behaviour at T2 (vs. 9.8% (100/1024) of non-depressed girls at T1) \( p < 0.001 \).

In logistic regression analysis, depression at T1 predicted antisocial behaviour at T2 differently among girls and boys (Table 5). Among girls depression at T1 predicted antisocial behaviour at T2 after controlling for antisocial behaviour at T1 and sociodemographic variables. Girls with depression at T1 had a 2.3-fold risk for antisocial behaviour at T2. Among boys depression at T1

Table 3
Concurrent comorbidity of depression and antisocial behaviour: prevalence [%(n)] of depression by antisocial behaviour and vice versa among 15 years old (T1) and at 2-year follow-up (T2)

<table>
<thead>
<tr>
<th></th>
<th>Girls (N = 1167) [%(n)]</th>
<th>Boys (N = 903) [%(n)]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate of depression by antisocial behaviour (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (1028a, 795b)</td>
<td>9.6 (99)</td>
<td>4.0 (32)</td>
</tr>
<tr>
<td>Yes (128a, 94b)</td>
<td>27.3 (35)</td>
<td>23.4 (22)</td>
</tr>
<tr>
<td>Rate of antisocial behaviour by depression (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (1022a, 835b)</td>
<td>9.1 (93)</td>
<td>8.6 (72)</td>
</tr>
<tr>
<td>Yes (134a, 54b)</td>
<td>26.1 (35)</td>
<td>40.7 (22)</td>
</tr>
<tr>
<td><strong>T2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate of depression by antisocial behaviour (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (1026a, 802b)</td>
<td>7.7 (79)</td>
<td>4.7 (38)</td>
</tr>
<tr>
<td>Yes (137a, 88b)</td>
<td>29.9 (41)</td>
<td>21.6 (19)</td>
</tr>
<tr>
<td>Rate of antisocial behaviour by depression (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (1043a, 833b)</td>
<td>9.2 (96)</td>
<td>8.3 (69)</td>
</tr>
<tr>
<td>Yes (120a, 57b)</td>
<td>34.2 (41)</td>
<td>33.3 (19)</td>
</tr>
</tbody>
</table>

\[^a\text{Girls.}\]
\[^b\text{Boys.}\]
predicted inversely antisocial behaviour at T2 after controlling for antisocial behaviour at T1 and for sociodemographic variables. Thus depression at T1 protected boys from antisocial behaviour at T2 (OR 0.4, \( p = 0.05 \)).

**Discussion**

Regarding homotypic continuity of depression and antisocial behaviour, the current study supports the findings from previous studies (e.g. Costello et al., 2003) indicating that these disorders have a fairly stable course in adolescence. The finding that continuity of either depression or antisocial behaviour did not differ by gender is consistent with the results of Ferdinand et al. (1995), but different from the results of Costello et al. (2003) proposing girls to show more continuity of depression than boys. The differences may be due to different time

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intervals or different case ascertainment used. Consistent with previous studies (e.g. Fergusson and Woodward, 2002), the concurrent comorbidity between depression and antisocial behaviour was strong during the 2-year follow-up. There were no significant gender differences in comorbidity, although gender differences at T1 almost reached significance, suggesting stronger comorbidity among boys. This finding is consistent with the results of Domalanta, Risser, Roberts, and Risser (2003), but differs from the results of Flannery et al. (2001) proposing depression to be more prevalent among antisocial girls than boys. Flannery et al. (2001), however, focused on extremely violent adolescents, whereas the present study investigated antisocial behaviour in a general population sample.

The main purpose of this study was to investigate longitudinal associations between depression and antisocial behaviour. In univariate analyses subsequent depression was more prevalent among adolescents of both sexes with a history of antisocial behaviour, but after controlling for previous depression this association lost significance. The finding that the failure model did not explain the developmental associations between antisocial behaviour and depression seems

Table 5
Risk for [odds ratio (OR), 95% confidence interval (CI)] antisocial behaviour at 2-year follow-up (T2) according to depression among 15-year-old (T1) adolescents

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Model 2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
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<tr>
<td>Depression at T1</td>
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<tr>
<td>No</td>
<td>Ref.</td>
<td>Ref.</td>
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<tr>
<td>Yes</td>
<td>3.4 (2.2–5.2)</td>
<td>2.4 (1.5–3.9)</td>
</tr>
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<td>Antisocial behaviour at T1</td>
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<tr>
<td>No</td>
<td>#</td>
<td>Ref.</td>
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<tr>
<td>Yes</td>
<td>7.4 (4.8–11.3)</td>
<td>7.6 (4.8–11.9)</td>
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<tr>
<td>Family structure</td>
<td></td>
<td></td>
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<tr>
<td>Intact</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Non-intact</td>
<td>#</td>
<td>1.1 (0.7–1.8)</td>
</tr>
<tr>
<td>Parental education level</td>
<td></td>
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<tr>
<td>Academic</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Non-academic</td>
<td>#</td>
<td>0.8 (0.5–1.3)</td>
</tr>
<tr>
<td>Parental unemployment</td>
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<tr>
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<td>Ref.</td>
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<td>One or both</td>
<td>#</td>
<td>1.0 (0.6–1.6)</td>
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<td>Residential stability</td>
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<tr>
<td>Over 10 years</td>
<td>#</td>
<td>Ref.</td>
</tr>
<tr>
<td>Less than 9 years</td>
<td>#</td>
<td>1.0 (0.6–1.6)</td>
</tr>
</tbody>
</table>

Ref. = reference group in logistic regression analysis and # = variable not in the model.
<sup>a</sup>In Model 1, crude OR are presented.
<sup>b</sup>In Model 2, OR are adjusted for antisocial behaviour at T1.
<sup>c</sup>In Model 3, OR are adjusted for antisocial behaviour at T1 and for sociodemographic variables (family structure, parental education level, parental unemployment during the past year and residential stability).
inconsistent with several previous studies (e.g. Kiesner, 2002). However, most previous studies have focused on the transition from late childhood to early adolescence (e.g. Capaldi, 1992) or they have had a considerably longer follow-up period from childhood to young adulthood (e.g. Fergusson et al., 2003). The present study covered the period from middle to late adolescence. It has been suggested that developmental associations between depression and antisocial behaviour may depend on the time when antisocial behaviour initiates (Lewinsohn, Gotlib, & Seeley, 1995), and that failure experiences triggered by antisocial behaviour may be age-related and differ across developmental stages (Wiesner, 2003). Our results suggest that the failure model is not adequate in middle adolescence.

The present study demonstrated that depression predicted subsequent antisocial behaviour, but the acting out model held true only among girls after controlling for previous antisocial behaviour. Girls with a history of depression were twice more likely than non-depressed girls to display subsequent antisocial behaviour. In contrast to the finding for girls, history of depression seemed to protect boys from subsequent antisocial behaviour. The protective influence on depression for subsequent antisocial behaviour is consistent with the study of Vermeiren, Schwab-Stone et al. (2002) who found depression to be protective against recidivism. It has been suggested that subsequent antisocial behaviour may be reduced due to apathy and diminished energy associated with depression or that depression and experiences of guilt/shame may indicate the potential for reflecting on one’s actions and their consequences for others (Vermeiren, Schwab-Stone et al., 2002). Further research is needed to ascertain why in the present study these mechanisms did not apply to girls. The developmental course of antisocial behaviour may differ by sex, as boys generally initiate antisocial behaviour earlier than girls do (e.g. Overbeek et al., 2001). Therefore, the longitudinal association between depression and antisocial behaviour may occur earlier among boys and to be non-apparent in middle adolescence.

The results of the present study need to be viewed in the light of certain limitations. Depression and antisocial behaviour were measured by self-report scales. However, although the RBDI is not a diagnostic instrument, it has been shown to be efficient and valid in distinguishing between depressed and non-depressed adolescents (Beck et al., 1974; Bennett et al., 1997; Kaltiala-Heino et al., 1999). Further, although there are known limitations in the reliability of self-reported antisocial behaviour, such as dishonesty, forgetfulness and exaggeration, self-report methods are generally considered reliable and valid methods in assessing antisocial behaviour (Junger-Tas, Terlouw, & Klein, 1994). In addition to this, the instrument used (YSR) has shown good psychometric properties and ability to predict DSM oppositional defiant and conduct disorder (Achenbach, 1991; Helstela & Sourander, 2001; Morgan & Cauce, 1999).

The key strengths of the study are a large community-based cohort of adolescents with a fair response rate. However, because the present analyses are based on 63% of the initial sample, and because only limited information about non-participants at T2 was available, the results may not be generalisable. Further, attrition analysis showed that non-participants at T2 were more likely to be depressed and behave antisocially at baseline than participants. On the other hand, given that both depression and antisocial behaviour have considerable continuity in adolescence (e.g. Costello et al., 2003), the rates of depression and antisocial behaviour may be underestimated at T2, but the found associations between these disorders are not likely to be affected by non-participants. The results may not be representative of the Finnish population of adolescents since none of these adolescents came from rural areas. Nevertheless, the large longitudinal samples
made it possible to test two models simultaneously for developmental associations between depression and antisocial behaviour. Most of the previous studies have focused on only one developmental model. The current data also allowed us to study gender differences. Most of the previous studies have not included gender comparisons.

Conclusion

Our findings indicated that antisocial behaviour and depression had considerable continuity in middle adolescence. Concurrent comorbidity between depression and antisocial behaviour was also remarkable. Among girls depression predicted subsequent antisocial behaviour in a 2-year span, but among boys depression seemed to protect them from subsequent antisocial behaviour. The present study offers implications for the prevention and treatment of adolescent depression and antisocial behaviour. Prevention should be initiated as soon as possible before the psychosocial adjustment of adulthood is impaired. In clinical settings, antisocial behaviour among adolescent girls should be considered as a possible marker of severe depression.

References


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