Associations between Depression, Problem Behavior and Severity of Substance Abuse
– Do they Differ across Gender? A Study of Swedish Adolescent Boys and Girls

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Abstract
Depression, problematic behavior and substance use are becoming increasingly common in adolescence. This study highlights the role of emotional and behavioral issues in Swedish adolescents and their respective associations with the severity of abuse of alcohol and drugs. Self-report questionnaires were used from a sample of 180 individuals enrolled in a Swedish clinic for adolescent substance abuse, aged 12-20. Results showed that individuals with behavior problems had the strongest association with substance use overall. Specifically, rule breaking behavior followed by withdrawal/depression. Examining gender differences showed that girls had the strongest associations with substance use overall. Implications for future research are discussed.

Keywords: Adolescence, depression, problematic behavior, substance use
Associations between Depression, Problem Behavior and Substance Abuse – Do they Differ across Gender? A Study of Swedish Adolescent Boys and Girls

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Sammanfattning


Nyckelord: Ungdomar, depression, beteendeproblem, substansanvändande.

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Associations between Depression, Problem Behavior and Severity of Substance Abuse – Do they Differ across Gender? A Study of Swedish Adolescent Boys and Girls

Depression, problem behavior and substance use are becoming increasingly common in adolescence. These issues are not only disabling for peoples’ everyday life but also costly for society. They are highly comorbid and in themselves risk factors for wide variety of negative outcomes such as suicide, criminal careers and substance abuse (Kovacs, 1989). Several studies have found strong associations between and across all three phenomena in adolescents (e.g. Pardini, White & Stouthamer-Loeber, 2007; Teplin, Abram, McClelland, Dulcan, & Mericle, 2002). A longitudinal study by McKowen et al. (2013) shows that depression is a strong predictor for substance abuse even after controlling for comorbidity with other mental health disorders. Furthermore, it reported a causal chain of events in which aggression and anxiety predicted depressive symptoms; depressive symptoms predicted substance abuse; and finally that substance abuse predicted delinquent behavior.

Gender differences have also been discovered across these phenomena. Research indicates that emotional problems has been shown to be a stronger predictor for delinquency in girls whereas substance abuse has been found to be a stronger predictor for boys (Welch-Brewer, Stoddard-Dare & Mallett, 2011). Furthermore, studies in juvenile detention populations show that females are more likely to have an affective disorder such as depression whereas males are more likely to have an externalizing disorder such as conduct disorder (Sevecke, Lehmkuhl & Krischer, 2008; Teplin et al., 2002). A systematic review conducted by Fazel, Doll and Langstrom (2008) found that in 16,570 detained youths 29% of the girls had been diagnosed with major depression compared to 11% of the boys. In order to improve upon the preventive care and formulate effective treatment programs it is important to understand how and when these disorders emerge, and how they are associated.
In children and adolescents depression is part of domain called internalizing disorders, which can be said to contrast the externalizing domain. The easiest way to discern these from each other is to think of the internalizing domain as inner-directed, emotional disorders, and the externalizing domain as outer-directed, behavioral disorders (Reynolds, 1992). There are however some possible confounders inherent to this categorization to which I will return later.

The internalizing domain include anxiety disorders, depressive disorders, psychosomatic disorders, eating disorders, gender identity disorder and psychotic disorders (Reynolds, 1992). The externalizing domain include conduct disorder, oppositional defiant disorder and attention-deficit/hyperactivity disorder (Farmer, Compton, Burns, & Robertson, 2002). This study measures two subgroups of depression from the internalizing domain: anxious/depressed and withdrawn/depressed, and two subgroups of conduct disorder from the externalizing domain: rule breaking behavior and aggressive behavior.

**Internalizing disorders**

Fear is something most people experience. It is helpful for our survival: it speeds up reaction time and prepares our body for physical strain. But living in a near constant state of fear is debilitating, exhausting and a reality for some people. The anxious/depressed subgroup is characterized by feelings of guilt, nervousness and fear. People who score high in this category are prone to a variety of issues that interfere in day-to-day activities such as crying, suicidal thoughts, rumination of negative thoughts and being afraid of substandard performances in a variety of environments such as school, relations and recreational activities (Nolen-Hoeksema, 2000). Studies have shown that adolescents diagnosed with anxious/depression are more prone to substance abuse (McKowen et al., 2013) and truancy (Walter et al., 2013) which in turn are strong predictors for problematic behavior such as delinquency. Furthermore, research suggest that individuals with a combination of anxiety and depression have a higher rate of suicide ideation, attempts and completions than those
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with a single disorder (Mineka, Watson & Clark, 1998). In addition, there is increasing evidence that anxiety and depression share the same genetic predisposition, and to some extent the same cognitive components (Mineka et al., 1998). In conclusion, the anxious/depressed comorbid disorder is not only a risk factor for externalizing disorders and substance abuse but also debilitating for simple day-to-day activities, and has severe outcomes if untreated.

Having basic social skills is a prerequisite for most aspects of childhood and adolescence such as forming social and romantic relationships, playing with friends and participating in a classroom. Many are lacking in these skills, however, which can have a variety of negative impacts that often translate into adulthood if untreated. The withdrawn/depressed disorder focuses on symptoms of loneliness, lack of enjoyment, energy and happiness (Achenbach & Rescorla, 2001). Children and adolescents who score high on this category are often rejected or excluded by their peers and have a low social self-concept in addition to the depressed manifestations (Gazelle & Rudolph, 2004). The development of withdrawal is thought to stem from the internal conflict of wanting to approach social settings and an abnormally high motivation to avoid social settings (Asendorf, 1990).

The relation between withdrawn/depressed disorder and substance use is not a direct one. Instead, withdrawal has been shown to increase the probability to develop anxiety or externalizing problems, which then result in use and abuse of substances (Perle et al., 2013). The implications of the withdrawn/depressed comorbid disorder are, besides a difficult childhood, long-term difficulties in relationships with troublesome implications for marriage, job stability and child rearing (Kerr, Lambert & Bem, 1996).

In addition to the high prevalence of these disorders in children and adolescents, they manifest differently across gender. For instance, depression has been observed more often in girls than in boys (Eaton et al., 1989; Garber & Flynn, 2001; Smith & Weissman, 1992), and
studies have found that the developmental trajectory for anxious/depression differ: a meta-
alysis conducted by Twenge and Nolen-Hoeksema (2002) using 310 samples with a total of
61,242 respondents showed that girls at age 13 reported steadily increasing levels of
depression which peaked at age of 17 while boys remained at the moderate level. All samples
used the Children’s Depression Inventory as a measure which has been proven reliable and
valid (for a review, see Sitarenios & Kovacs, 1999), however it has been criticized for not
measuring depressive disorder, but rather a mixture of depressive and anxious symptoms
(Saylor, Finch, Spirito & Bennett, 1984). However, this is an advantage for this study since it
focuses on the comorbidity of the anxious and depressive disorder.

The withdrawn/depressed disorder differ from the anxious/depressed across gender.
Being socially withdrawn is more common in boys (Lindeman, Harakka & Keltikangas-
Jarvinen, 1997) even though internalizing disorders are generally more common in girls. A
possible explanation for this is a 3-step chain of events: aggressive behavior is more common
in boys (Leadbeater, Kuperminc, Blatt & Hertzog, 1999; Timmons-Mitchell et al., 1997);
aggression exacerbates peer rejection, -exclusion and –victimization, which in turn leads to
avoidance, unsociability and shyness (Bowker, Markovic, Cogswell & Raja, 2011).
Conversely, the study by Bowker et al. (2011) showed that low levels of overt aggression and
high levels of shyness in girls increased the risk of peer exclusion. These latter findings lack
proper generalizability however, although it is a plausible finding given that research has
found that socially popular girl are often described by non-popular peers as snobby, mean and
conceited (Closson, 2009).

Externalizing disorders

Most children and adolescents have at some point engaged in behavior such as lying,
swearing or shoplifting. This is mostly seen as a normal behavior, part of children’s
development that usually desists or decreases with age. If it persists or increases, however, it
can have many negative consequences. Rule breaking behavior is characterized by non-violent disruptive behavior such as lying, stealing, truancy and substance use (Achenbach & Rescorla, 2001). As previously mentioned it is a subgroup in the externalizing domain, which together with aggressive behavior make up the conduct disorder diagnosis. People who score high on rule breaking behavior are also likely to begin exhibiting aggressive behavior, as they have been shown to have a high rate of comorbidity as well as a causal relationship where rule breaking precedes aggressive behavior (Bartels et al., 2003; Niv, Tuvblad, Raine & Baker, 2013).

In itself rule breaking behavior is disruptive for both the individual as well as his or her peers, family and environment, however the biggest cause of concern is its role as a predictor for adult criminality, risky sexual behavior, antisocial behavior and substance abuse (Loeber & Dishion, 1983). It should be noted that rule breaking behavior has been shown to stop in adolescents as well, something Moffitt (1993) called “adolescence-limited antisocial behavior”. In short, this term refers to a phase in adolescence where there is a gap between the adolescents’ biological and social age (for example wanting to smoke at age 15, which is illegal in most countries). This gap closes when the person reaches the appropriate biological age, and thus the antisocial behavior stops (Moffitt, 1993). The severity of the potential outcomes from rule breaking behavior makes it an important area of study for two main reasons: a), it is a known risk factor for a wide variety of negative behaviors, and b), because of its early manifestation it is important to be able to discern potentially harmful behavior from the natural behavior that is associated with development at these ages.

Violence is not as commonly looked upon as a normal, developmental phase in children as lying, swearing and shoplifting. Although most children at some point fight or display aggression, it is important to make sure it does not escalate as it can have many negative, long term, outcomes. Aggressive behavior exacts a high cost on society and have
many consequences for the individual and his or her environment. It is characterized by a stubborn, mean and destructive behavior that manifests in physical aggression, disobedience, threats and a loud and temperamental disposition (Achenbach & Rescorla, 2001). A relatively low percentage (3-7%) of individuals with both aggressive and rule breaking behavior exhibit these severely enough to merit a conduct disorder diagnosis (Costello, Mustillo, Erkanli, Keeler & Angold, 2003). However, of those who do an estimated 50% engage in criminal behavior and substance abuse as adolescents, and an estimated 75-80% of adults with a conduct disorder diagnosis are unemployed, have unstable relationships or engage in physical aggression impulsively (Moffitt et al., 2008). Studies have also observed that children who exhibit early aggressive behavior are more prone to develop conduct disorder and persist in their delinquency, and subsequent criminality, than those who start exhibiting aggression in adolescence (Broidy et al., 2003; Thompson et al., 2011). Besides having a negative impact on the individual these consequences are highly costly for society in form of legal fees, violent crimes, vandalism, and healthcare costs.

Externalizing disorders differ in trajectories across gender as well. Whereas internalizing disorders are generally more common in girls, externalizing disorders have been observed more often in boys (Leadbeater et al., 1999; Timmons-Mitchell et al., 1997). One theory for these gender differences is that boys’ coping mechanism for stress is often aggressive behavior or expressions of anger, whereas girls are more likely to use mechanisms that internalize their response and thus develop emotional problems rather than behavioral (Eschenbeck, Kohlmann & Lohaus, 2007). This theory is further supported in studies that have investigated the causal relationship between maltreated children and their coping strategies. Direct relationship between maltreatment and externalizing behavior have been found in boys, with the same relationship for girls mediated by a state of internalizing behavior. In addition, the effects were found to be lasting over time (Maschi, Morgen,
Bradley & Hatcher, 2008). However, some studies have not been able to discover this relationship (Silva, Graña & González-Cieza, 2013), so further research is merited. Given these differing trajectories across gender, externalizing behaviors and disorders make for an important area of study in order to better target individuals. By studying and understanding these better it is possible to further tailor preventive programs and apply them earlier as well as differently for boys and girls respectively.

Substance use

Because of the similar trajectories, consequences and within-gender patterns for alcohol- and drug use and abuse they are both described under the term ‘substance use/abuse’ unless otherwise specified. Substance use have many harmful consequences for both individuals and society. Broadly speaking it causes physical damage such as organ failure, diabetes and hypertension (see Anderson et al., 1993); psychological damage such as depression (Deykin, Levy & Wells, 1987); societal and environmental damage such as violent crimes, medical costs, drunk driving and job loss or –absence (World Health Organization, 2007). Furthermore, a national study estimated economical costs for excessive alcohol use at $223.5 billion in USA during the year of 2006 (Bouchery, et. al., 2011). To be diagnosed with substance abuse according to the Diagnostic and Statistical Manual of Mental Disorders - IV an individual must a) fail to fulfill important obligations, b) repeat substance use despite physical hazards, c) have repeated legal problems and d) continue substance use despite repeated legal or social problems that resulted from the use (American Psychiatric Association, 2002). Given the high prevalence of substance abuse discussed earlier it makes for an important area of study in order lower these costs from a health perspective as well as an economical perspective.

Among adolescents there is a high prevalence of substance abuse. A national study conducted in USA by the Substance Abuse and Mental Health Services Administration
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(SAMHSA) (2009) reported that 1.57 million people between the ages 12 and 17 were diagnosed with either substance abuse or –dependence. Furthermore, research studying the developmental trajectories show that earlier substance exposure leads to a higher risk of abuse earlier in life (Young et al., 2002). For instance, SAMSHA (2009) found that individuals who first used alcohol at age 14 or younger were 7.1% more likely to be diagnosed with alcohol abuse or –dependence at 21 years or older than those who first used alcohol between ages 15 and 17, and 12.1% more likely than those who first used it between ages 18 and 20. Similar statistics were found for the first-time use of marijuana and subsequent abuse- or dependence diagnosis.

There are important cultural differences to take into account for substance use and abuse. For instance, the use of cannabis is reported to be more prevalent in North America, Oceania, Africa and Western Europe, whereas it is less common in Europe (Forkby, Olausson & Turner, 2013). Within Europe there are substantial differences as well: among Swedish 16-year olds it was reported that 8% had at some point used cannabis, whereas the same age group in Spain reported 38% in the year of 2011 (Forkby et al., 2013). For alcohol, differences can be observed even among the Nordic countries. Statistics on alcohol use gathered by Nordic Studies on Alcohol and Drugs reported that in 2010 there were a total of 757 deaths in Sweden from alcohol-related illnesses, which is 9.7 per 100,000 inhabitants over the age of 15. This statistic is similar to Norway’s, which had a total of 393 deaths (10 per 100,000 inhabitants over the age of 15). For Finland the same year, however, there were a total 1,656 deaths from alcohol-related illnesses, which is 36.7 per 100,000 inhabitants (Nygren, 2013). All of these statistics indicate a clear need for culture-specific studies as any single method for prevention or treatment is unlikely to accommodate these differences.

Boys and girls have shown to be similar in their levels of alcohol consumption and diagnosis of substance abuse in adolescence. This finding is supported in the SAMSHA report.
(2009) which found that across all age groups the prevalence of substance abuse and –
dependence diagnoses were twice as high in males, whereas between ages 12 to 17 they were
at similar rates (6.7% for boys, 7.4% for girls). However, they differ in developmental
trajectories. Girls reportedly have an earlier initial use of alcohol, however boys display a
greater developmental change in alcohol behavior over time and thus pass girls in middle to
late adolescence (Chen & Jacobson, 2012). This indicates that for preventive care in
adolescence there are no grounds for targeting boys and girls differently, however it is
important to consider the increased risk for boys in the long term, as well as the differences in
risk factors leading to the substance abuse.

Although much research has been made within each of these areas on adolescents and
across gender, there are a few limitations which has prompted this study. First of all there are
very few studies on Swedish population samples. Cross-national studies increases
generalizability, however it is also important to examine potential specific variations and
trends within a country. Another limitation is that many studies have used other sources than
self-reports to measure internalizing symptoms, which can lead to underestimation or
overestimation of these symptoms. Lastly, most studies examining substance abuse has used
this variable broadly, such as including tobacco use. Few studies seem to have examined
alcohol- and drug abuse specifically.

In light of these facts the aim of this study is to examine the associations between
symptoms of depression, problem behavior and severity of substance abuse in a sample of
Swedish adolescents, and how they differ across gender. Based on previous research I expect
that 1), the respective symptoms for internalizing and externalizing will be associated with
each other; 2), that internalizing symptoms will have a stronger association with severity of
substance abuse for girls than for boys and 3), that externalizing symptoms will have a
stronger association with severity of substance abuse for boys than for girls.
Method

Participants

The sample for this study was extracted from a 12 month longitudinal study performed in the spring of 2004. A random sample of 373 adolescents in contact with a Swedish clinic for adolescent substance abuse were invited to participate. A total of 180 (48.3%) from those invited agreed to participate. Of those 180 there were 99 (55%) girls and 81 (45%) boys. The minimum age was 12 and the maximum was 20, with a mean age of 16.82 (SD = 1.84). There were no significant age differences between boys and girls. Assessment of the participants’ alcohol- and drug use, internalizing problems and externalizing problems were made through self-report questionnaires. Inspection of the frequency distributions for each variable revealed that no outliers have affected the mean values. A majority of the participants displayed pre-substance misuse mental disorders at baseline assessment (Hodgins, Oliver, Tengström & Larsson, 2010).

Measures

For this study information from Youth Self-Reports (YSR), the Alcohol Use Disorders Identification Test (AUDIT) and the Drug Use Disorders Identification Test (DUDIT) was used. The data was part of a longitudinal study, however this study uses a cross-sectional design.

The YSR self-report questionnaires comprise of 119 items with answers ranging from 0 (not true), 1 (somewhat or sometimes true) or 2 (very true or often true) and a total score ranging from 0 to 210. These items are divided into three separate scales: the DSM-oriented, syndrome and broad band. For this study four subscales from the syndrome scales were used: anxious/depressed, withdrawn/depressed, rule breaking behavior and aggressive behavior. The anxious/depressed subscale is a 13-item questionnaire designed to measure depression coupled with anxiousness. It involves questions about fear, feelings of worthlessness, guilt...
and suicidal thoughts. The total score ranges from 0 to 26, and the Cronbach’s alpha is .86.

The withdrawn/depressed subscale is an 8-item questionnaire designed to measure the introvert aspect of depression. Questions measure concepts such as enjoyment, lack of energy, shyness and being withdrawn. The total score ranges from 0 to 16, and the Cronbach’s alpha is .75.

The subscale for rule breaking behavior comprise of 15 items that measure adolescents’ non-violent disruptive behavior. The questions involve measures of delinquent peers, stealing and truancy. Total score ranges from 0 to 30, and the Cronbach’s alpha is .78.

Aggressive behavior is a 17-item questionnaire that measure physical and verbal aggression in adolescents. The questions include measures of disobedience, fighting, stubbornness, mood changes and threatening others. The total score ranges from 0 to 34, and the Cronbach’s alpha is .82. The YSR questionnaires have been proven to be reliable and valid measures (for reviews, see Ebesutani et al., 2011; Song, Singh & Singer, 1994).

AUDIT is a 10-item questionnaire designed to identify hazardous alcohol use, dependence symptoms and harmful alcohol use with focus on recently displayed symptoms. Examples of questions are: ‘How often do you have a drink containing alcohol?’ , ‘How often during the last year have you found that you were not able to stop drinking once you had started?’ and ‘Have you or someone else been injured as a result of your drinking?’. Eight of the items have five response alternatives from 0 (never) to 4 (4 or more times a week), two of the items have three response alternatives: 0 (no), 2 (yes, but not in the last year) and 4 (yes, during the last year). The total score ranges from 0 to 40, the Cronbach’s alpha is .86. Several studies have proven AUDIT to be a well validated and reliable measure for alcohol-related disorders (for reviews, see Allen, Litten, Fertig & Babor, 1997; Reinert & Allen, 2002).

DUDIT is an 11-item questionnaire with example questions such as ‘Do you use more than one type of drug on the same occasion?’, ‘Over the past year, have you felt that your
longing for drugs was so strong that you could not resist it?”, and ‘How often over the past year have you needed to take a drug the morning after heavy drug use the day before?’.

Eight of the items have five response alternatives ranging from 0 (never) to 4 (daily or almost daily) and two of the items have three response alternatives: 0 (no), 2 (yes, but not over the past year) and 4 (yes, over the past year). The total score for the DUDIT ranges from 0 to 44, and the Cronbach’s alpha is .94. DUDIT was developed as a tool to screen for drug use disorders within groups with a recorded history of drug use and has since been used to screen for individuals in the general population as well (Nesvåg et al., 2010; Voluse et al., 2012). It was validated in a Swedish prison population as well as in detoxification settings (Berman, Bergman, Palmstierna, & Schlyter, 2005; Durbeej et al., 2010).

**Procedure**

Trained psychologists administered all questionnaires to the participants individually after informed consent had been given. The study was approved by the ethical committee of the Karolinska Institutet of Stockholm in compliance with the declaration of Helsinki.

**Analyses**

Bivariate correlation analyses, t-test and linear multiple regression analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 22. The correlations were computed separately for boys and girls, using the split file function on the data. For the regression analyses AUDIT and DUDIT were used as independent variables, and the split file function was used to compute analyses for boys and girls separately. Age was entered as an independent variable before AUDIT and DUDIT in separate regression analyses to control for those effects.

**Results**

The distribution for each variable is summarized in Table 1. Girls displayed more internalizing problems than boys, while there were few differences between genders for both
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Interestingly girls also displayed a slightly higher average for aggressive behavior than boys.

Table 1

*Descriptive Statistics for Internalizing Factors, Externalizing Factors, AUDIT-scores and DUDIT-scores*

<table>
<thead>
<tr>
<th>Participants (n=180)</th>
<th>Girls M (SD)</th>
<th>Boys M (SD)</th>
<th>t</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawn/depressed</td>
<td>4.76 (3.12)</td>
<td>3.47 (3.05)</td>
<td>2.640</td>
<td>161</td>
<td>.009</td>
</tr>
<tr>
<td>Anxious/depressed</td>
<td>6.3 (4.84)</td>
<td>4.01 (4.6)</td>
<td>3.043</td>
<td>161</td>
<td>.003</td>
</tr>
<tr>
<td>Rule breaking behavior</td>
<td>11.39 (4.82)</td>
<td>11.96 (5.6)</td>
<td>0.696</td>
<td>161</td>
<td>.487</td>
</tr>
<tr>
<td>Aggressive behavior</td>
<td>12.71 (5.07)</td>
<td>12.1 (6.13)</td>
<td>0.694</td>
<td>161</td>
<td>.489</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUDIT</td>
<td>10.52 (7.92)</td>
<td>11.53 (8.35)</td>
<td>-0.804</td>
<td>167</td>
<td>.422</td>
</tr>
<tr>
<td>DUDIT</td>
<td>8.88 (11.84)</td>
<td>7.14 (11)</td>
<td>0.972</td>
<td>165</td>
<td>.332</td>
</tr>
</tbody>
</table>

*Note. M = mean, SD = standard deviation.*

The bivariate correlations, summarized in Table 2, showed that girls had overall strong associations between both of the internalizing disorders and AUDIT as well as DUDIT, with the exception for anxious/depressed and AUDIT. For boys, besides the positive association between AUDIT and DUDIT only aggressive behavior was associated with AUDIT, and only rule breaking was associated with DUDIT.

Table 2

*Bivariate Correlations for Internalizing Factors, Externalizing Factors, AUDIT-scores and DUDIT-scores*

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Withdrawn/depressed</td>
<td>-</td>
<td>.64**</td>
<td>.37**</td>
<td>.31**</td>
<td>.24*</td>
<td>.40**</td>
</tr>
<tr>
<td>2 Anxious/depressed</td>
<td>.71**</td>
<td>-</td>
<td>.29**</td>
<td>.23*</td>
<td>.15</td>
<td>.30**</td>
</tr>
<tr>
<td>3 Rule breaking behavior</td>
<td>.46**</td>
<td>.36**</td>
<td>-</td>
<td>.62**</td>
<td>.52**</td>
<td>.43**</td>
</tr>
<tr>
<td>4 Aggressive behavior</td>
<td>.58**</td>
<td>.48**</td>
<td>.66**</td>
<td>-</td>
<td>.24*</td>
<td>.17</td>
</tr>
</tbody>
</table>
Associations between Depression, Problem Behavior and Substance Abuse

Girls showed a strong positive association between rule breaking behavior and AUDIT-scores, whereas boys showed no significant association between these factors. For both boys and girls there was a strong association between the respective symptoms for internalizing and externalizing disorders, i.e. between withdrawn/depressed and anxious/depressed, and rule breaking and aggressive behavior. To further examine these associations a series of linear multiple regression analyses were conducted, see Table 3. All analyses were performed with AUDIT- and DUDIT-scores as independent variables, with a total of four analyses. Age was entered as the first independent variable before AUDIT and DUDIT in four separate analyses.

Table 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>β AUDIT</th>
<th>β DUDIT</th>
<th>β AUDIT</th>
<th>β DUDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdwn/depressed</td>
<td>.09</td>
<td>.28**</td>
<td>.10**</td>
<td>.08</td>
</tr>
<tr>
<td>Anxious/depressed</td>
<td>.08</td>
<td>.17*</td>
<td>.05*</td>
<td>.08</td>
</tr>
<tr>
<td>Rule breaking behavior</td>
<td>.24**</td>
<td>.37**</td>
<td>.26**</td>
<td>.29**</td>
</tr>
<tr>
<td>Aggressive behavior</td>
<td>.22**</td>
<td>.11</td>
<td>.08**</td>
<td>.27**</td>
</tr>
</tbody>
</table>

Note. β represents the standardized beta coefficient. The beta coefficients to the right represent the values after controlling for the effect of age.

Rule breaking behavior showed the greatest variation (25.7%) from AUDIT and DUDIT, with the latter being the stronger predictor. AUDIT was found to positively predict aggressive behavior whereas DUDIT did not. This stands in contrast with previous research.
which reports associations between drug use and aggressive behavior. Withdrawn/depressed showed the second greatest variation (10.3%) from AUDIT and DUDIT, but only DUDIT was found to positively predict it at a significant level. However, DUDIT was a stronger predictor for withdrawn/depressed than for anxious/depressed. Age did not significantly affect the associations between the internalizing variables, however the total variance for rule breaking behavior and aggressive behavior increased with 6 and 5% respectively in the latter model.

To examine these associations across gender four more multiple regression analyses were conducted, see Table 4. AUDIT- and DUDIT-scores were used as the independent variables in all analyses. Age was again entered as the first independent variable before AUDIT and DUDIT in four separate analyses.

Table 4

<table>
<thead>
<tr>
<th>Variable</th>
<th>AUDIT</th>
<th>DUDIT</th>
<th>$R^2$</th>
<th>$F$</th>
<th>AUDIT</th>
<th>DUDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdrawn/depressed</td>
<td>.12</td>
<td>.36**</td>
<td>.17**</td>
<td>9.45**</td>
<td>.11</td>
<td>.33**</td>
</tr>
<tr>
<td>Anxious/depressed</td>
<td>.04</td>
<td>.28*</td>
<td>.09*</td>
<td>4.56*</td>
<td>.04</td>
<td>.29*</td>
</tr>
<tr>
<td>Rule breaking behavior</td>
<td>.41**</td>
<td>.28**</td>
<td>.33**</td>
<td>22.03**</td>
<td>.42**</td>
<td>.38**</td>
</tr>
<tr>
<td>Aggressive behavior</td>
<td>.19</td>
<td>.10</td>
<td>.06</td>
<td>2.94</td>
<td>.20</td>
<td>.19</td>
</tr>
</tbody>
</table>

*Note. β represents the standardized beta coefficient. The beta coefficients to the right represent the values after controlling for the effect of age.

*p<.05; **p<.01

The results for girls did not differ much from the results for both genders. Worth noting is that AUDIT was a stronger predictor for rule breaking behavior, and there was no significant variation in aggressive behavior. DUDIT was also found to be a stronger predictor for both internalizing variables. Finally, the regression analyses controlling for age revealed that it had not affected the associations between the internalizing variables and AUDIT and DUDIT. The variance of rule breaking behavior did not increase more than 1%, however the
variance for aggressive behavior showed an increase of 11%. The same procedure was used to examine the associations for boys, see Table 5.

Table 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>AUDIT β</th>
<th>AUDIT R²</th>
<th>AUDIT F</th>
<th>DUDIT β</th>
<th>DUDIT R²</th>
<th>DUDIT F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdrawn/depressed</td>
<td>.09</td>
<td>.12</td>
<td>.03</td>
<td>1.13</td>
<td>.13</td>
<td>.13</td>
</tr>
<tr>
<td>Anxious/depressed</td>
<td>.18</td>
<td>-.03</td>
<td>.03</td>
<td>1.07</td>
<td>.19</td>
<td>-.02</td>
</tr>
<tr>
<td>Rule breaking behavior</td>
<td>.05</td>
<td>.48**</td>
<td>.25**</td>
<td>11.16**</td>
<td>.13</td>
<td>.50**</td>
</tr>
<tr>
<td>Aggressive behavior</td>
<td>.25*</td>
<td>.12</td>
<td>.10*</td>
<td>3.70*</td>
<td>.38**</td>
<td>.15</td>
</tr>
</tbody>
</table>

Note. β represents the standardized beta coefficient. The beta coefficients to the right represent the values after controlling for the effect of age. *p < .05; **p < .01

The main difference observed between girls and boys was that AUDIT predicted aggressive behavior for boys, but not for girls. The other main difference was that AUDIT did not significantly predict rule breaking behavior for boys, whereas for girls it was found to be a strong predictor. However, DUDIT was a stronger predictor for rule breaking behavior for boys than for girls. Finally, the results show that AUDIT and DUDIT did not predict either of the internalizing variables significantly for boys, whereas DUDIT was found to positively predict both internalizing variables for girls. Lastly, age did not significantly affect the values for boys.

Discussion

This study highlights the role of emotional and behavioral issues in Swedish adolescents and their respective associations with the severity of abuse of alcohol and drugs. The results imply that Swedish adolescents with behavioral problems are the most involved when it comes to alcohol- and drug use. Furthermore, this study adds to the growing body of research for disorders in childhood and adolescence by showing that the respective problem
areas within the emotional and behavioral domains were highly associated with each other. Contrary to previous research, it also showed that rule breaking behavior was more associated with drug use than aggression for both boys and girls, and finally that girls had an overall higher association than boys to substance use.

The find that the symptoms for both emotional and behavioral problems, respectively, are strongly associated is in line with the first hypothesis. The notion that the disorders within each domain are associated with each other is also supported by studies that have examined comorbidity and causality between them (e.g. Bartels et al., 2003; Loeber & Dishion, 1983; Niv et al., 2013; Perle et al., 2013; Reynolds, 1992). This finding underscores the importance of effective treatment for adolescents’ with these disorders, since the risk for negative outcomes increase drastically with multiple disorders. Furthermore, it explains some of the surprising finds in this study.

In line with the second hypothesis, girls showed a strong association between emotional problems and substance use. These results are supported in studies that show a higher degree of emotional problems in girls than boys (e.g. Eaton et al., 1989; Garber & Flynn, 2001; Smith & Weissman, 1992; Twenge & Nolen-Hoeksema, 2002) as well as the association between emotional problems and substance use (McKown et al., 2013; Perle et al., 2013).

The main find of this study is supported by the studies in this area which links both rule breaking behavior (Loeber & Dishion, 1983) and aggressive behavior (Moffitt et al., 2008) to alcohol and drug use. However, behavioral problems were equally associated to substance abuse for both boys and girls, which stands in contrast with the third hypothesis as well as previous research. By looking at the gender differences, as well as rule breaking and aggression separately, it showed that boys’ alcohol use was associated with aggressive behavior, but not with rule breaking behavior. A possible explanation for this is that boys
have a later age of initiation for alcohol than girls (Chen & Jacobson, 2012) and rule breaking behavior occurs at an earlier age, as well as usually precedes aggressive behavior (Bartels et al., 2003; Niv et al., 2013). This suggests that boys’ rule breaking behavior might occur in an age earlier than their initiation to alcohol, whereas it is aligned with the aggressive behavior that develops later on. This can also be applied to explain the finding that girls’ alcohol use is associated with rule breaking behavior but not aggressive behavior: their earlier age of initial alcohol use aligns with the age of emergence of rule breaking behavior. After that, either the use of alcohol desists or the rule breaking never develops into an aggressive behavior. This latter explanation is more probable given that girls generally display a lesser degree of aggression whereas their use of alcohol remains fairly stable (Leadbeater et al., 1999; SAMSHA, 2009; Timmons-Mitchell et al., 1997), and it would also explain why girls have a stronger association between externalizing problems and substance use than boys in this study.

Being withdrawn and depressed was more associated with drug use than being anxious and depressed. This finding stands in contrast with previous research which suggests that a), anxious/depression is highly correlated with substance use and –abuse (McKowen et al., 2013) and that b), withdrawn/depression does not have a an equally direct link to substance use and –abuse, but more often has an externalizing, or other internalizing, mediator (Perle et al., 2013). A possible explanation for this is comorbidity, in that withdrawn/depressed individuals in this sample may have had another simultaneous disorder which increased the substance use instead of the withdrawn/depressed condition. This notion is supported by the study of Perle et al., 2013, which highlights the comorbidity between withdrawn/depressed and externalizing problems. Furthermore, as previously mentioned studies support the notion of high associations between disorders within the respective domains. This fact coupled with
the high associations between the withdrawn/depressed and anxious/depressed disorders in this study makes the possibility of a comorbid internalizing disorder likely.

Surprisingly, drug use was associated with rule breaking behavior but not with aggressive behavior. Previous research suggests the opposite relationship, in that aggressive behavior is more commonly associated with drug use (Moffitt et al., 2008). Moreover, given the young age that rule breaking behavior usually manifests in it is uncommon to see it covary with drug use. For girls, the same explanation for their association between alcohol use and rule breaking behavior may apply here. For boys, there are some possible explanations for these results. The first possibility is cultural differences: contrary to traditional findings, Swedish rule breaking adolescents may be more prone to use drugs than alcohol. A possible contributing factor to this point is the governmental monopoly on alcohol distribution that is utilized in Sweden, which makes the availability more limited compared to many other countries. However, it is important to note that this explanation is highly speculative and should be investigated further. Furthermore, this does not explain the lack of association between drug use and aggressive behavior. If the premise of a causal relationship where rule breaking precedes aggressive behavior is correct, it follows that drug use have preceded, and replaced, alcohol use for the adolescents in this sample. This notion is counterintuitive and further cause for continued research. A second possibility, which would also explain the lack of association between drug use and aggressive behavior, is that the drug using adolescents in this sample were not using heavier drugs such as heroine, morphine or ecstasy, which has been shown to have stronger links to aggression than for instance cannabis (Fauziah, Mohamad, Chong & Azmi, 2012; Reid, Elifson & Sterk, 2007).

A limitation to this study is that it uses self-reports as a measure for externalizing symptoms, which are preferably assessed through the use of parents- or teacher reports. The main reason for this is that symptoms of externalizing disorders are overt by nature. As such,
adults close to the child or adolescent are thought to be the best observers of such behaviors (Reynolds, 1992). Another limitation is that the sample size is relatively small. Because of this the statistical power is decreased and the risk of failing to detect actual significant differences are increased. Besides the alpha-value and effect-size in the population, sample size is positively correlated with statistical power. As such a larger sample will yield a larger power, and thus the ability to a) detect a significant difference if there is one, and b) confidently claim that no significant difference exists if results suggest so, both increase. A third limitation is that the sample may be skewed toward adolescents with behavioral problems. Problematic behavior is, as previously mentioned, overt by nature and thus easier to detect by parents who may insist on contacting a clinic for substance abuse. Furthermore, the categorization of internalizing versus externalizing disorders, as opposed to a dimensional approach, may be a limitation: some disorders present themselves with mixed symptoms of emotional and behavioral features (Perle et al., 2013; Reynolds, 1992). Eating disorders for example emerge from cognitive dysfunctions and as such are located in the internalizing domain, however they manifest in overt behaviors such as vomiting, excessive eating or self-starvation (Nolen-Hoeksema, 2011). However, depression and problem behavior are not as sensitive to these mixed manifestations, and as such it will hopefully have had a minimal impact on the study. Finally, the cross-sectional design limits the results to associations instead of the preferred causal explanations between variables.

A strength of this study is that it uses self-reports as a measure for internalizing symptoms, which is the preferred method to assess internalizing disorders in children. Research indicate that multiple sources (parents, teachers and self-reports) often give confounding and inconsistent results because the majority of internalizing symptoms are manifested covertly, and as such often not directly observable (Reynolds, 1994). Lastly,
another strength is that all of the screening tools used for measuring (YSR, AUDIT and DUDIT) are well validated and reliable.

Given the negative effects that depression, problem behaviors and substance abuse have if fully developed, studying their early signs to understand how they emerge, map the way they develop, and change the way they do so is important not only for the individuals who suffer from these conditions, but for society as well in terms of growth and finance. The lack of association between aggression and drug use for boys in this study underscores the need for studies to detect culture-specific trends. This notion is further supported by studies that have failed to transfer the benefits of well validated treatment programs across cultures: a randomized clinical trial by Sundell et al. (2008) examined if the results from multi-systemic therapy would be similar when administered in two different cultures. In a Swedish population sample they found no significant differences after treatment in level of conduct disorder between the treatment group which received multi-systemic therapy, and the control group which received treatment-as-usual (individual counselling and group therapy). The opposite result was found for trials with the same setup in USA and Norway, where the treatment group instead showed significantly lowered levels of conduct disorder after treatment compared to the control group. These results implies the need for cultural and contextual considerations for both developing and implementing treatment programs.

The fact that girls and boys showed a similar degree of associations between problem behavior and substance use underscores the need for studies investigating if there are specific, less conventional, risk factors for Swedish girls related to substance use and abuse. Studies have shown that girls and boys have similar rates of use and abuse in adolescence, however their respective risk factors have usually been reported as internalizing disorders for girls and externalizing disorders for boys.
This study has not been an attempt to bring about policy change in the healthcare system, but rather an attempt to further map these phenomena in order to guide future research in terms of importance of risk factors and how they may vary across gender. The results from this study contrast some of the research that has been done on these factors, which opens up for new areas of study. Specifically, culture-specific trends in Swedish adolescents, and specific risk factors for substance abuse for Swedish girls.

In conclusion, depression, problem behavior and substance abuse present a large amount of problems for individuals and society for several reasons: 1) their early manifestations increases the risk of making them lasting over time, 2) the outcomes from these disorders when untreated are highly costly, debilitating for the individual and sometimes even fatal, and 3) their high comorbidity rates increases the risk for the negative outcomes. This underscores the need for evidence-based treatment programs customized for specific genders, cultures and combinations of disorders, with focus on early intervention.
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