Sex-specific predictors of exposure to hospital-treated physical and sexual assaults among young adults admitted to psychiatric inpatient care at adolescence

Lauri Oulasmaa,[1] Pirkko Riipinen,[1] Helinä Hakko,[2] Kaisa Riala,[2] and Liisa Kantojärvi[2]

1   Department of Psychiatry, Research Unit of Clinical Neuroscience, University of Oulu, Finland

2   Department of Psychiatry, Oulu University Hospital, Oulu, Finland

Abstract

This study examined the associations of psychiatric disorders, suicidal behavior and family-related characteristics during adolescence, to subsequent experiences of hospital-treated physical, or sexual assaults, among 508 young adults with a history of psychiatric inpatient care at adolescence (aged 13-17 years). DSM-IV based adolescent psychiatric disorders were assessed at index hospitalization using K-SADS-PL. Treatment episodes for assaults were obtained from the health care register, provided by the Finnish National Institute for Health Welfare. 14.4% of the participants had experienced physical or sexual assault during their lifetime. Results of logistic regression analysis indicated that anxiety disorder (OR=9.6) and non-suicidal self-injury (OR=3.7) in adolescence for males, and personality disorder (OR=3.4) for females, were associated with increased likelihood for subsequent assault exposure leading to hospitalization. These findings can be used in targeting vulnerable adolescents and designing primary prevention strategies.

Keywords: psychiatric disorder, victimization, nonsuicidal self-injury, personality disorder, anxiety disorder.

Introduction

Numerous studies have demonstrated that mental or substance use disorders are common consequences of exposure to physical or sexual assaults (Ford, Elhai, Connor, & Frueh, 2010; Norman et al., 2012; Peterson, Voller, Polusny, & Murdoch, 2011; Turner, Finkelhor, & Ormrod, 2006; Wright et al., 2013). However, the association between these disorders and later exposure to physical or sexual assaults has not been widely researched.

Substance use disorder and assault exposure

In a recent study of 5,170 university students, alcohol abuse was observed to be a risk factor for exposure to violence (Caamano-Isorna, Adkins, Moure-Rodríguez, Conley, & Dick, 2018). The results showed that alcohol abuse and alcohol dependence were associated with a two to three times higher risk for exposure to physical assault in both males and females, and for exposure to sexual assault in males. In addition, cannabis use was also recognized as a risk factor for physical assault exposure in both males and females. Similarly, Martino, Collins & Ellickson (2004) reported that use of marijuana predicted subsequent exposure to sexual violence, in both males and females, and to physical violence in males, during the following six years. Alcohol abuse was also associated with exposure to physical violence in females. Furthermore, patients suffering from comorbid mental and substance use disorders have also been considered vulnerable to both physical and sexual violence (de Waal, Dekker, Kikkert, Kleinhesselink, & Goudriaan, 2017). Among the study population of 243 outpatients diagnosed with substance dependence or abuse, and at least one other mental disorder, rates of exposure to violence were high in both men (35% physical, 4% sexual) and women (47% physical, 29% sexual) during the previous 12 months. Amstadter et al. (2011) observed that prior drug use and family drug problems were significant predictors of subsequent physical assault victimization in young adulthood.

Moreover, substance abuse was observed to be common among females (aged 14 years or higher) seeking medical care after being sexually assaulted (Resnick et al., 2013). According to their results, 73% of the participants reported recent substance use before the assault, 40% reported a history of substance abuse, and 12% reported previous treatment for substance misuse. Likewise, Brooker and Tocque (2016) observed that rape victims, compared with individuals without a history of sexual abuse, had a twofold increased likelihood of having a

history of alcohol dependence, and a threefold increased likelihood of drug dependence. In addition, suicidal thoughts, neurotic disorder, and history of psychiatric hospitalization were four, three and two times more common among rape victims, respectively.

Other mental disorders and assault exposure

A systematic review by Latalova, Kamaradova & Prasko (2014) included 34 studies concerning violent victimization of adult patients with severe mental illness, of which nine indicated that patients with severe mental illness such as schizophrenia, bipolar disorders, major depression or other psychotic disorder, are at greater risk of violent victimization, compared to other community members. Young age, comorbid substance use and homelessness were identified as risk factors for victimization. Moreover, an earlier review by Choe, Teplin & Abram (2008) proposed that violent perpetration and victimization are more common among people with severe mental illness, compared to general population. They also stated that victimization is a greater public health concern than perpetration. Similar results were also observed in more recent studies (Bhavsar & Bhugra, 2018; Meijwaard et al., 2015).

Further, a large Swedish cohort study indicated that people with psychiatric disorders were 3 to 4 times more likely to have been either subjected to violence, or to have perpetrated violence, compare to their siblings without psychiatric disorders (Sariaslan, Arseneault, Larsson, Lichtenstein, & Fazel, 2020). In addition, in a Norwegian study examining the prevalence of vulnerability factors among young women attending a sexual assault center, 41% reported to as having mental health problem and 35 % reported one or more previous incidents of sexual assault (Vik, Nöttestad, Schei, Rasmussen, & Hagemann, 2016). Finally, suicide attempts and non-suicidal self-harm have also been shown to correlate with violent assaults (Darke, Torok, Kaye, & Ross, 2010).

Aim of current study

In the current study, we examined the prevalence of hospital-treated physical and sexual assault victimizations among young adults, who were admitted to psychiatric inpatient treatment due to acute psychiatric or substance use disorders, between the ages of 13 and 17 years. The aim was to determine whether certain characteristics at adolescence, including socio-demographic and family-related characteristics (e.g. family structure and domestic violence) and clinical characteristics (e.g. psychiatric disorders and suicidality), predict later exposure to physical or sexual assaults, among males and females separately. Moreover, the relationship between the victim and assaulter, in both physical and sexual assaults, as well as the manner of assault and the anatomical site of injuries sustained in physical assaults, were also investigated, to shed light upon this rather under-studied area. For these purposes, we utilized a large population-based data of former adolescent psychiatric inpatients from Northern Finland, and the long-term follow-up data for assault exposures from the national registers.

Methods

Study population

This study forms part of a clinical follow-up project STUDY-70, which investigates the associations between diverse psychosocial risk factors and severe psychiatric or substance use disorders, as well as long-term outcomes of the former adolescent psychiatric inpatients. The original study population consisted of 508 adolescents (208 boys, 300 girls), who were admitted to psychiatric inpatient treatment in Unit 70 at the Psychiatric Department of Oulu

University Hospital in Finland, between April 2001 and March 2006 (referred to in this study as index hospitalization).

On admission to adolescent psychiatric inpatient care, the adolescents were aged between 13 and 17 years (mean age 15.5 years, SD 1.3) and the great majority of them (98.3%) were White. The adolescents suffered mainly from acute psychiatric disorders or substance use disorders. The catchment area of Unit 70 includes the regions of Oulu and Lapland, covering 43% of Finland's geographical area. All adolescents in need of acute psychiatric hospitalization from this area are treated in Unit 70.

Assaulted study participants

The study participants exposed to an assault (hereafter referred to as assault cases) were identified based on the information obtained from the Care Register for Health Care (CRHC), provided by the Finnish National Institute for Health Welfare. All treatment episodes due to assaults were obtained from the CRHC using the following ICD-10 diagnostic codes: R45.6, T74, X85-Y09, Y87.1, Z04.4-5 and Z61.4-6.

A total of 272 treatment episodes for assault were identified from the CRHC, until the end of year 2016. Nine of these episodes included two different diagnostic codes each, making the total number of diagnostic codes for assault 281. Table 1 presents each ICD-10 code for assaults, with definitions, as well as the number of treatment episodes, and individual patients within each assault code, observed in our data. From the original study population of 508 former adolescent inpatients, a total of 73 (44 males, 29 females) study participants had experienced physical or sexual assault by their young adulthood. In this study, the term "assault", if not explicitly specified otherwise, refers to both physical and sexual assaults.

Assault characteristics

Information about the assailant and the manner of assault was obtained from the diagnostic codes for assaults, and the anatomical site of injury from the subsidiary diagnostic ICD-10 codes, recorded in the CRHC for treatment episodes for each assault. If a participant had experienced multiple assaults, multiple assailants, more than one type of assault, or sustained injuries to several parts of the body, the following procedure was applied to select the most serious characteristic: 1. Most frequently appeared assailant, manner of assault or anatomical site of injury; 2. Assailant, manner of assault or anatomical site concerning the most severe injury of the participant (severity was judged by the length of treatment episode and/or the count of revisions/re-examinations); 3. Whether the injury caused by the assault was the main or secondary diagnosis.

Socio-demographic and family-related characteristics at adolescence

Socio-demographic and family-related characteristics were obtained using semi-structured Schedule for Affective Disorder and Schizophrenia for School-Age children, Present and Lifetime version (K-SADS-PL) interview during index hospitalization. Those included sex (male/female), age (in years) at index hospitalization and family structure prior to hospitalization (categorized into four groups: (1) living with both biological parents; (2) single biological parent or shared custody; (3) child welfare placement and (4) other, including foster family, residential care or living alone.

The information about the employment status of the mother and father was obtained from the EuropASI interview. EuropASI is an objective, face-to face structured interview, containing questions on various life areas and problems. It has been proved reliable and valid when applied to substance-using populations (Kokkevi & Hartgers, 1995). A mother or father was defined

as being employed if they had a regular full-time or part-time job. The information on adolescents' place of residence was also obtained from the EuropASI, and it was categorized into two groups: (1) urban (more than 100,000 inhabitants), and (2) rural (less than 100,000 inhabitants).

Information on witnessing and experiencing domestic violence was based on the screening section for post-traumatic stress disorder (PTSD) of the K-SADS-PL interview, in which the adolescents were asked whether they had witnessed domestic violence (witnessed explosive arguments involving threatened or actual harm to a parent; no / yes), or whether they had suffered from physical abuse by parent(s) (bruises sustained on more than one occasion or more serious injury sustained; no / yes), or whether they had been sexually abused by another person (isolated or repeated incidents of genital fondling, oral sex, or vaginal or anal intercourse; no / yes).

Clinical characteristics at adolescence

Suicidality

Information about suicidal behavior (suicidal ideation, non-suicidal self-injury (NSSI) and suicide attempts) was also obtained from the K-SADS-PL interview. Suicidal ideation was defined by adolescent's recurrent thoughts of suicide and planning of the suicide method. NSSI covered non-suicidal physical self-damaging acts without intent to die (four or more times a year or has caused serious injury to self). Suicide attempts included performed life-threatening attempts with definite suicidal intent or with potentially medically lethal consequences.

Psychiatric disorders

The DSM-IV–based psychiatric disorders of the adolescents were obtained by interviewing the participants at index hospitalization using K-SADS-PL. The psychiatric diagnoses were categorized into five major psychiatric diagnostic groups: (1) substance-related disorders (DSM-IV: 303.9, 304.0–304.6, 304.8–304.9, 305.0, 305.2–305.7, 305.9), (2) anxiety disorders (300.00–300.02, 300.21–300.23, 300.29, 300.3, 308.3, 309.81), (3) affective disorders (296.2–296.3, 300.4, 311), (4) conduct or oppositional defiant disorders or ADHD (312.8–312.9, 313.81, 314.00–314.01, 314.9, 299.80), and (5) psychotic disorders (295, 296.0, 296.4–299.0, 297.1–299.0, 301.13, 301.22). Multiple diagnoses were possible, with some adolescents having diagnoses from several diagnostic groups. The follow-up information about personality disorder (PD) diagnoses (primary and additional diagnoses, ICD-codes F 21, 60-60.9, DSM-IV TR codes 301.00, 301.20–301.9) were gathered from CRHC after discharge from index hospitalization until the end of 2012. PD diagnoses were validated to ensure reliability, and the validation process is described in another study (Kantojärvi, Hakko, Riipinen, & Riala, 2016).

Data analytic plan

Statistical significances of group differences in categorical variables were analyzed using Pearson's Chi-square or Fishers' exact test. The association of socio-demographic and clinical characteristics to exposure to assaults was examined using logistic regression analysis. All tests were two-sided and the limit for statistical significance was set at $p < 0.05$. All statistical tests were performed using IBM SPSS version 24.

Results

Characteristics of physical and sexual assaults

As outlined in Figure 1, a significantly greater proportion of males (n = 40, 19.2%) than females (n = 18, 6.0%) had been exposed to physical assault ($p < 0.001$). No significant difference was observed between the proportions of sexually assaulted males (n = 4, 1.9%) and females (n = 11, 3.7%, $p = 0.298$). Only 20% (n = 15) of the assaulted participants were assaulted before index hospitalization and, of these, three participants were assaulted again after their index hospitalization. Mean age at the first assault for these pre-index assaults was 14.2 years (SD 1.9).

Characteristics of the physical and sexual assaults experienced by the study participants are presented in Table 2. Males exposed to physical assault were statistically significantly more commonly injured with a sharp weapon, compared to females (25.0% of assaulted males vs. 0.0% of assaulted females, $p = 0.023$). Males had also received more injuries to limbs (25.0% vs. 0.0%, $p = 0.023$), although the most frequently damaged body part was the head for both males and females (47.5% vs. 61.1%, $p = 0.337$). Females were more likely than males to be assaulted by their partner (27.8% vs. 5.0%, $p = 0.025$). No difference was observed in the characteristics of sexual assaults between sexes.

Socio-demographic and family-related characteristics at adolescence

As illustrated in Table 3, living in a child welfare placement during adolescence was more common among both assaulted males (40.9% of assaulted vs. 20.7% of non-assaulted males, $p = 0.006$) and assaulted females (31.0% vs. 10.3%, $p = 0.004$), compared to non-assaulted males and females, respectively. Moreover, assaulted males were more likely to have witnessed domestic violence (40.9% vs. 25.0%, $p = 0.041$), and assaulted females to have experienced domestic violence (44.8% vs. 24.4%, $p = 0.025$). Assault exposure was less common among females who had lived with two biological parents (17.2% vs. 46.9%, $p = 0.002$).

Adolescence-related predictors for assault exposure up to early adulthood

The adolescence-related clinical characteristics of the study participants in relation to their assault exposure, up to early adulthood, are presented in Table 4. Males exposed to assault, when compared to non-assaulted males, had more commonly suffered from anxiety disorder (34.1% vs. 8.5%, $p < 0.001$) and non-suicidal self-injury (22.7% vs. 10.4%, $p = 0.042$) during adolescence, whereas adolescent conduct disorder was significantly more prevalent in assaulted females (58.6% vs. 31.7%, $p = 0.005$), compared to those not assaulted. Follow-up information of participants also revealed that a significantly higher proportion of assaulted females had been diagnosed with personality disorder, compared with non-assaulted females (27.6% vs. 9.2%, $p = 0.007$). For males, there was no significant difference in the prevalence of personality disorder between assaulted and non-assaulted participants (13.6% vs. 11.0%, $p = 0.791$).

Table 5 shows the results of our logistic regression analysis. As illustrated, anxiety disorder (OR = 9.61, 95% CI = 3.23-28.56, $p < 0.001$) and non-suicidal self-injury (OR = 3.70, 95% CI = 1.14-12.00, $p = 0.030$) remained as significant predictors of exposure to assault for males after adjusting for other predictors. For females, living in child welfare placements during adolescence (OR = 6.71, 95% CI = 1.64-27.50, $p = 0.008$) as well as later diagnosis of personality disorder (OR = 3.41, 95% CI = 1.19-9.82, $p = 0.023$) significantly increased the likelihood of exposure to assault.

Discussion

Anxiety disorder and assault exposure

The current study, using the data of former adolescent psychiatric inpatients, aimed to examine adolescence-related characteristics in relation to exposure to physical or sexual assault up to early adulthood. The results showed that male study participants with anxiety disorder diagnosed in adolescence appeared to have a nearly 10-fold increased likelihood for exposure to physical or sexual assault during early adulthood compared to those without a history of adolescent anxiety disorder. Similar results were observed in a retrospective study involving 2,500 Swedish young adults aged between 20 and 24 years (Cater, Andershed, & Andershed, 2014). In that study, the prevalence of self-reported anxiety symptoms was high among both physically victimized males (20.3% of victims vs. 13.4% of non-victims) and females (40.3% vs. 21.9%), but the study could only find co-occurrence, not causality, between anxiety symptoms and victimizations. Anxiety symptoms were associated with an increased risk of peer-victimization over the following year among 13-15 year old students (Karlsson, Stickley, Lindblad, Schwab-Stone, & Ruchkin, 2014). The authors of that study discussed whether anxious participants' behavior patterns make them appear more vulnerable to aggressive peers, or do bullies expect certain types of response from their victims (e.g. signs of pain or resignation) which they are more likely to receive from victims suffering from anxiety. They also considered the possibility of anxiety symptoms being indicative of previous peer victimizations. Silver et al. (2005) used birth cohort data, with follow-up to the age of 21 years, and found that those study participants with anxiety disorder experienced a 4-fold higher rate of sexual assaults but not physical assaults within the past year. Similarly, Creighton and Jones (2012) stated that 49% of adult sexual assault victims disclosed affective disorders, including anxiety. These results, of the association between anxiety disorder and sexual assaults, differ slightly from ours, since the majority (91%) of assaults for males were physical in the current study. This may be explained by the small number of sexual assaults among males, which did

not allow us to investigate these associations in more detail. Overall, our findings of anxiety and exposure to assaults are in the line with earlier studies. However, the majority of assaults occurred after index hospitalization, which may suggest causality between these two phenomena, but it is also worth considering that possible unreported assault exposures, prior to index hospitalization, may have affected the victimized adolescents' mental health.

Personality disorder and assault exposure

In this study, personality disorder (PD) of female study participants was related to a 3.4-fold increased likelihood for assault exposure occurring up to early adulthood. The majority (64%) of these women with PD suffered from borderline PD. To our knowledge, research evidence is limited in regard to the vulnerability to assault exposure of those with personality disorder. Borderline PD has consistently been linked with childhood abuse, which may account for participants' defenselessness against assaults later in life (Kuo, Khoury, Metcalfe, Fitzpatrick, & Goodwill, 2015; Zanarini et al., 1997). Earlier studies, using the same database as the current study, have also demonstrated an association of personality disorders to bullying involvement and violent criminality, which may indirectly reflect the exposure to violence (Antila et al., 2017; Arola et al., 2016). In these studies, female victims of bullying had an almost 4-fold likelihood of developing a personality disorder later in life compared to adolescents without experiences of bullying (Antila et al., 2017). Furthermore, females with borderline personality disorder had a 6-fold increased likelihood for committing violent crimes (Arola et al., 2016). Moreover, females who are both violent and victims of violence may suffer from severe PTSD symptoms and personality traits which maintain the risk for revictimization (Kuijpers, van der Knaap, Leontien M., & Winkel, 2012). Those findings, together with the findings of our study, verify the multi-complexity of violence in females: violent behavior of females may relate to

previous bullying, criminality and exposure to violence, which all inflict both a social and financial burden on our society.

In our data from a former adolescent psychiatric inpatient population, substance use disorder, diagnosed at adolescence, did not predict later assault exposure, although one third of assaulted females and half of assaulted males had suffered from it. This contradicts the findings of previous studies conducted using mainly general population samples (Brooker & Tocque, 2016; Martino et al., 2004; Resnick et al., 2013). Unfortunately, no information about the participants being under the influence of alcohol or other substances at the time of their assault exposure was available for the purpose of our study.

Non-suicidal self-injury and assault exposure

Male study participants, who had experienced non-suicidal self-injury (NSSI) at adolescence, were found to have a 4-fold increased likelihood for assault exposure by the early adulthood. In general, NSSI is defined as the intentional, self-inflicted damage to the surface of the body without suicidal intent (Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007) which is commonly used as an analogous term to self-mutilative behavior (SMB), defined as deliberate damage to one's own body tissue without suicidal intent (Nock & Prinstein, 2004). SMB is commonly viewed by participants as a means of providing temporary relief from negative emotions such as anxiety, anger, depression and frustration, which can be caused by various reasons (e.g. physical or sexual abuse or other childhood traumas) which have been shown to predict later exposure to assault (Carli et al., 2010; Evren, Cinar, Evren, & Celik, 2012a; Klonsky & Muehlenkamp, 2007). Moreover, Evren et al. (2012b) reported that younger age, impaired anger control and physical aggression were predictors for SMB among patients with a history of childhood trauma. Both impaired anger control and physical aggression are

considerable risk factors for participants becoming involved in confrontations which may result in them being assaulted. SMB has also been found to associate with Borderline personality disorder and impulsivity (Evren et al., 2012a), which may both contribute to assault exposure in a similar way. Non-suicidal self-injury in adolescence as a predictive factor for assault exposure later in life has not been widely investigated and calls for further studies.

Family structure and assault exposure

In the present study, the role of family structure during adolescence to experience of assault in young adulthood was emphasized. In female study participants, living in child welfare placements during adolescence increased the odds of assault exposure by almost 7-fold, after controlling for various covariates. The reasons for children being placed in child welfare placements during adolescence are varied, but common causes are serious parental problems, such as substance use or violent atmosphere at home, and aggressive or inappropriate behavior by the child that parent(s) are not able to manage. In the first situation, witnessing or experiencing domestic violence or problematic substance use in the family home during childhood, have both been shown to increase the likelihood for later exposure to assault (Armstadter et al., 2011). In the second situation, participants' own behavior is itself, a risk factor for being exposed to assaults later in life. Our bivariate analyses showed that female study participant living with two biological parents during adolescence, and male study participants living with at least one biological parent(s), were less commonly exposed to assault by their early adulthood. These findings are somewhat equivalent with those of previous studies, although in the current study, living with one biological parent appeared to be a protective factor rather than a risk factor for males (Allroggen, Rau, Ohlert, & Fegert, 2017; Turner, Finkelhor, & Ormrod, 2007; Turner, Finkelhor, Hamby, & Shattuck, 2013).

It's been proposed that differences in factors relating to family dysfunction (e.g. parental conflict and family drug/alcohol problems), socio-economic status (e.g. adverse neighborhood conditions) and family instability (e.g. residential moves, living in multiple households and family adversity) could explain the varying prevalence of exposure to violence between family structures (Turner et al., 2007; Turner et al., 2013). An earlier study of the current study population, showed that adolescents with a child welfare placement background had more commonly committed violent and non-violent crimes, as well as drug-related offences, compared to adolescents from two biological parent families (Ikäheimo, Laukkanen, Hakko, & Räsänen, 2013). Consequently, engaging in criminal activities may lead to a person's involvement in confrontations which may result in them being assaulted.

Assault characteristics

In terms of the assault incident characteristics observed in our study, male study participants were more likely to be physically assaulted with sharp weapons and to receive injuries to limbs, mainly the upper limbs, compared to females. In both male and female victims of physical assault, the most common injuries were to the head. The majority of female study participants who were victims of assault were assaulted by their partners. The results of the study by Subba et al. also showed that assaulted participants most commonly received injuries to their head and neck (57%), followed by upper limbs (18%), and assailants of females were often their partners (40%) (Subba, Binu, Menezes, Kumar, & Rana, 2010). It was also stated that males formed the majority (3.6:1 ratio) of the assaulted participants, which was also the case in the current study population (19% of males vs. 6% of females). High prevalence of upper limb injuries among males may indicate an increased propensity in assaulted males to resist and seek to defend from attack, and with relatively stronger upper limbs compared to females. Finally, the fact that the majority of injuries reported were to the head, may align with people's tendency

to seek healthcare assistance when they perceive the severity of injury is greatest (Rahman, Andersson, & Svanström, 1998), i.e. being more likely to attend hospital if they suffer a head injury than a limb injury. The over saturation of this type of injuries may be directly related to our data collection method.

Strengths and limitations

There are some limitations regarding this study. Firstly, the information on assault incidents treated in outpatient settings is not comprehensive, since the Finnish Care Register for Health Care (CRHC) only covers treatment in specialized level health care settings. However, information on hospital discharges cover all inpatient care, whether they occurred in health centers, hospitals or other institutions providing inpatient care throughout the whole of Finland. Therefore, assault cases represent those deemed severe enough to require inpatient care or assessment in specialized level outpatient clinics. It is possible that numerous assault exposures have occurred resulting in lower severity injuries not requiring specialized level treatment and, similarly, non-penetrative sexual assaults may not always result in injuries requiring hospital treatment. It is also possible that some of the sexually assaulted males have not sought professional help and, therefore, they may be underrepresented in our study (Masho & Alvanzo, 2010).

Secondly, the study population consisted of psychiatric inpatients and, therefore, the conclusions concerning the general population must be made with caution. Thirdly, assaults that occurred prior to index hospitalization were included in the analyses, because the development of many psychiatric disorders begins during childhood but may not manifest until adolescence or adulthood. However, of all the assaults recorded in the study, the proportion of pre-index assaults was very small. We assume that this did not have an influence on our results

and related conclusions, but it warrants consideration with respect to causality of the phenomena investigated in our study. Finally, due to our study design, no data was available considering study participants' current socio-demographic characteristics, such as homelessness or lack of insurance. However, we would not consider lack of insurance as a risk factor for assault exposure in the current study because, in Finland, every resident of a Finnish municipality, regardless of insurances or income, is entitled to receive all necessary treatment in the Finnish public healthcare system (The Social Insurance Institution of Finland, n.d.). Moreover, we would not regard homelessness as a notable risk factor, because homelessness is uncommon in Finland. In 2019, less than 1000 citizens under 25 years of age were registered as being homeless (The Housing Finance and Development Centre of Finland, 2020).

The strength of the study is that, by including assault cases based on the information of the CRHC using ICD-10 diagnostic coding system, the observed assault cases are definitely concrete cases, which provides us a certain kind of authenticity compared to case definitions based on self-reports by study participants (Sund, 2012). Further, our definition of adolescent psychiatric disorders is comprehensive and reliable because they were assessed using the K-SADS-PL interview, showing high psychometric properties for defining psychiatric disorders in adolescent populations (Ambrosini, 2000; Kaufman et al., 1997; Kim et al., 2004). A sex-specific comparison of predictive factors and assault characteristics has rarely been performed in previous studies and, thus, our study represents an important addition to the small body of research literature on this topic.

Conclusions

In conclusion, early detection of risk factors for future assault exposure is crucial in protecting adolescents' health and welfare. The current study provides important information about these

risk factors for both sexes. This information can be utilized in the screening of vulnerable individuals in clinical practice and in designing relevant primary prevention interventions. However, due to our study design, it is possible that the proportion of assault exposures reported in this study underestimates the total number of assault exposures among the study population, and it should be considered that unreported assaults, prior to index hospitalization, may have influenced victimized participants' mental health and behavior. In future studies, sex-specific predictors for assaults should be investigated further and verified using larger, randomly selected samples of the general population and with longer follow-up time. Further, the mediating factors of the association between anxiety disorder and exposure to assaults should be studied. Finally, a useful source of information for assault cases could be the criminal records provided by the Finnish Legal Register Centre. This will allow the opportunity to identify those persons sentenced to prison for assault.

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Table 1.

Assault-related ICD-10 diagnostic codes with observed number of total treatment episodes,
and individual study participants, concerning each diagnostic code.

ICD-10 code	Definition	Number of treatment episodes	Number of exposed study participants
Physical assaults			
T74.1	Physical abuse	17	13
X85	Assault by drugs, medicaments and biological substances	1	1
X91	Assault by hanging, strangulation and suffocation	1	1
X94	Assault by rifle, shotgun and larger firearm discharge	1	1
X99	Assault by sharp object	14	11
Y00	Assault by blunt object	5	5
Y04	Assault by bodily force	35	20
Y07	Assault by other maltreatment syndromes	28	19
Y08	Assault by other specified means	5	3

Y09	Assault by unspecified means	19	8
Y87.1	Sequelae of assault	1	1
Z61.6	Problems related to alleged physical abuse of child	2	2
Sexual assaults			
T74.2	Sexual abuse	7	5
Y05	Sexual assault by bodily force	3	2
Z04.4	Examination and observation following alleged rape and seduction	12	10
Z61.4	Problems related to alleged sexual abuse of child by person within primary support group	121	3
Z61.5	Problems related to alleged sexual abuse of child by person outside primary support group	9	3
Any assault		281	73

Note. A person may have been exposed to several types of assault.

Table 2.

Assault characteristics of the exposed study participants, by sex.

Physical assault incidents	Total (N = 58) n (%)	Male study participants (N = 40) n (%)	Female study participants (N = 18) n (%)	*p*-value*
Average age at first assault (SD)	21.5 (4.5)	20.9 (4.6)	22.9 (4.2)	.113

Manner of assault				
No weapon	18 (31.0)	10 (25.0)	8 (44.4)	.219
Blunt	4 (6.9)	2 (5.0)	2 (11.1)	.581
Sharp	10 (17.2)	**10 (25.0)**	**0 (0)**	**.023**
Firearm	1 (1.7)	1 (2.5)	0 (0)	1.000
Other	3 (5.2)	2 (5.0)	1 (5.6)	1.000
No data	22 (37.9)	15 (37.5)	7 (38.9)	.920
Part of body damaged				
Head	30 (51.7)	19 (47.5)	11 (61.1)	.337
Body	9 (15.5)	4 (10.0)	5 (27.8)	.119
Limb	10 (17.2)	**10 (25.0)**	**0 (0)**	**.023**
No data	9 (15.5)	7 (17.5)	2 (11.1)	.706
Assaulter				
Partner	7 (12.1)	**2 (5.0)**	**5 (27.8)**	**.025**
Acquaintance	7 (12.1)	6 (15.0)	1 (5.6)	.417
Other	6 (10.3)	6 (15.0)	0 (0)	.163
Unspecified	15 (25.9)	10 (25.0)	5 (27.8)	1.000
No data	23 (39.7)	16 (40.0)	7 (38.9)	.936
Sexual assault incidents	Total (N = 15) n (%)	Male (N = 4) n (%)	Female (N = 11) n (%)	
Average age at first assault	16.4 (4.7)	14.0 (2.9)	17.3 (5.0)	.246

Assaulter

Guardian	3 (20.0)	2 (50.0)	1 (9.1)	.154
Acquaintance	1 (6.7)	0 (0)	1 (9.1)	1.000
Other	4 (26.7)	2 (50.0)	2 (18.2)	.516
No data	7 (46.7)	0 (0)	7 (63.6)	.077

Any assault incident		Total (N = 73) n (%)	Male (N = 44) n (%)	Female (N = 29) n (%)	
	Average age at first assault	20.4 (5.0)	20.2 (4.8)	20.8 (5.2)	0.658

Note. From the total of 10 injuries to limbs, 8 were located on the upper limbs. Two female participants were exposed to both physical and sexual assaults but were listed as physically assaulted. When choosing single characteristic options (manner, location of injury and assaulter) for participants with multiple assault characteristics, the procedure described in *Assault characteristics* -subsection of the **Methods** -section was used.

* Pearson's Chi-square test or Fisher's Exact test, two-tailed significance.

Table 3.

Socio-demographic and family-related characteristics at adolescence, by sex.

	Exposure to assault up to early adulthood			
	Males (N = 208)		Females (N = 300)	
	Yes	No	Yes	No

	(N = 44)	(N = 164)	*p-*	(N = 29)	(N = 271)	*p-*
	n (%)	n (%)	value*	n (%)	n (%)	value*
Family structure at adolescence						
Two biological parents	7 (15.9)	50 (30.5)	0.054	**5 (17.2)**	**127 (46.9)**	**0.002**
One biological parent	10 (22.7)	61 (37.2)	0.072	9 (31.0)	75 (27.7)	0.702
Child welfare placement	**18 (40.9)**	**34 (20.7)**	**0.006**	**9 (31.0)**	**28 (10.3)**	**0.004**
Other	9 (20.5)	19 (11.6)	0.126	6 (20.7)	41 (15.1)	0.424
Parental unemployment	15 (34.1)	40 (24.4)	0.247	6 (20.7)	50 (18.5)	0.802
Place of residence (urban)	11 (25.0)	36 (22.0)	0.687	6 (20.7)	57 (21.0)	1.000
Witnessed domestic violence	**18 (40.9)**	**41 (25.0)**	**0.041**	13 (44.8)	79 (29.2)	0.092
Experienced domestic violence	11 (25.0)	41 (25.0)	1.000	**13 (44.8)**	**66 (24.4)**	**0.025**

Note. Family structure "other" includes foster family, residential care or living alone. Assault includes exposures to physical and/or sexual assaults. Place of residence was defined as urban if it had more than 100,000 inhabitants.

* Pearson's Chi-square test or Fisher's Exact test, two-tailed significance.

Table 4.

Adolescence-related clinical characteristics of assaulted study participants, by sex.

	Exposure to assault up to early adulthood					
	Males (N = 208)			Females (N = 300)		
	Yes	No	*p-*	Yes	No	*p-*
	(N = 44)	(N = 164)	value*	(N = 29)	(N = 271)	value*
	n (%)	n (%)		n (%)	n (%)	
Psychiatric disorders at adolescence						
Psychotic disorder	4 (9.1)	26 (15.9)	0.337	2 (6.9)	38 (14.0)	0.395
Anxiety disorder	**15 (34.1)**	**14 (8.5)**	**<0.001**	12 (41.4)	76 (28.0)	0.196
Mood disorder	15 (34.1)	61 (37.2)	0.729	18 (62.1)	157 (57.9)	0.698
Conduct disorder	31 (70.5)	91 (55.5)	0.086	**17 (58.6)**	**86 (31.7)**	**0.005**
Substance use disorder	24 (54.5)	63 (38.4)	0.060	10 (34.5)	98 (36.2)	1.000
Suicidal behavior at adolescence						
Non-suicidal self-injury	**10 (22.7)**	**17 (10.4)**	**0.042**	15 (51.7)	102 (37.6)	0.162
Suicidal ideation	12 (27.3)	41 (25.0)	0.846	14 (48.3)	137 (50.6)	0.847
Suicide attempt	5 (11.4)	21 (12.8)	1.000	5 (17.2)	73 (26.9)	0.280
Personality disorder at age 16 years or above	6 (13.6)	18 (11.0)	0.791	**8 (27.6)**	**25 (9.2)**	**0.007**

Note. Follow-up diagnosis for personality disorder at the age of 16 years or above was obtained from CRHC after the index hospitalization. Assaults include exposures to physical and/or sexual assaults.

* Pearson's Chi-square test or Fisher's Exact test, two-tailed significance.

Table 5.

Adolescence-related predictors for exposure to assault up to early adulthood, by sex.

Adolescence-related characteristics	Likelihood for assault exposure					
	Males (n = 208)			Females (n = 300)		
	OR	95% CI	*p*-value*	OR	95% CI	*p*-value*
Socio-demographics						
Family structure						
Two biological parents	ref			ref		
One biological parent	0.98	0.30-3.28	0.979	2.74	0.82-9.26	0.103
Child welfare placement	2.47	0.76-8.05	0.132	**6.71**	**1.64-27.50**	**0.008**
Other	2.54	0.65-9.89	0.180	3.52	0.85-14.60	0.083
Age (in years) at admission	1.14	0.83-1.58	0.419	0.96	0.68-1.37	0.824
Place of residence (urban)	1.07	0.40-2.86	0.889	0.99	0.34-2.88	0.980
Parental unemployment	1.09	0.46-2.58	0.847	0.77	0.26-2.31	0.641
Witnessed domestic violence	2.05	0.82-5.10	0.123	1.20	0.45-3.17	0.721
Experienced domestic violence	0.64	0.24-1.72	0.372	1.51	0.56-4.09	0.419
Clinical characteristics						
Psychotic disorder	0.88	0.22-3.61	0.862	0.63	0.11-3.56	0.602
Anxiety disorder	**9.61**	**3.23-28.56**	**<0.001**	1.65	0.64-4.24	0.297

Affective disorder	0.62	0.23-1.63	0.329	0.91	0.33-2.53	0.854
Conduct disorder	1.99	0.71-5.58	0.193	2.10	0.79-5.57	0.137
Substance use disorder	2.00	0.84-4.77	0.117	0.49	0.19-1.28	0.146
Non-suicidal self-injury	**3.70**	**1.14-12.00**	**0.030**	1.65	0.64-4.22	0.297
Suicide ideation	1.13	0.37-3.45	0.834	1.25	0.44-3.54	0.679
Suicide attempts	0.54	0.14-2.14	0.378	0.36	0.11-1.20	0.095
Personality disorder at age 16 years or above [a]	1.03	0.33-3.21	0.963	**3.41**	**1.19-9.82**	**0.023**

Note. Follow-up diagnosis for personality disorder at the age of 16 years or above was obtained

from CRHC after the index hospitalization. OR = Odds Ratio, CI = Confidence Interval.

Assaults include exposure to physical and/or sexual assault.

* Pearson's Chi-square test or Fisher's Exact test, two-tailed significance.

[a] Borderline personality disorder covered the majority (64.3%) of diagnoses of the study

participants with personality disorder.