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An exploratory study of the relationship between adversities and chronic pain in the Norwegian residential youth care population

Graduate thesis in Clinical program in psychology
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Foreword

This thesis is based on data from the research project Mental health in children and adolescents in child welfare institutions in Norway by Regional Centre for Child and Youth Mental Health and Child Welfare (RKBU), Central Norway. The focus of the thesis was motivated by a special interest in the field of trauma- and child psychology, as well as an interest in the associations between physical and mental health. Topic was chosen together with project manager and co-supervisor Nanna Sønnichsen Kayed and main supervisor Trude Reinfjell. I did not participate in the data collection, but had an independent role in formulating research questions, handling the variables and performing the statistical analysis. The work also consisted of an application to Regional Committees for Medical and Health Research Ethics (REK). Trude Reinfjell, Nanna Sønnichsen Kayed and Stian Lydersen have helped guide these processes.

I would like to thank my main supervisor, Trude Reinfjell. I truly appreciate her great supervision through sharing of knowledge and patience throughout the process. I also want to thank Nanna Kayed for access to data, as well as availability and great input along the process, Stian Lydersen for his readiness to help in carrying out the statistical analysis, and friends and family for support throughout.

Sammendrag

Bakgrunn: Ungdommer i barnevernsinstitusjoner er en gruppe med høyere forekomst av overgrep og omsorgssvikt, og ansees å være en høyrisikogruppe for mentale og fysiske helseproblemer. Tidligere forskning har påvist en assosiasjon mellom negative livshendelser og helseplager. Til tross for dette er det lite forskning på forholdet mellom kronisk smerte og overgrepserfaringer i barnevernspopulasjonen. Målet med denne studien er å utforske forekomsten av smerte på tvers av ulike overgrepserfaringer og mulig påvirkning av kjønn og psykiske lidelser i denne målgruppen.

Metode: Prosjektet er en del av en større, nasjonal undersøkelse *Psykisk helse hos barn og unge i barnevernsinstitusjoner*, ved Regionalt kunnskapsenter for barn og unge – Psykisk helse og barnevern (RKBU), Midt-Norge. Alle barnevernsinstitusjoner med ungdom i alderen 12 til 20 ble invitert til å delta. Blant de 86 institusjonene med 601 ungdommer som ønsket å delta, samtykket 400 (67% av de inviterte) ungdommer og foresatte. Informasjon om kronisk smerte og psykiske lidelser (DSM-IV), samt det meste av informasjon om overgrep og omsorgssvikt ble innhentet ved bruk av CAPA intervju.

Resultater: Forekomsten av kronisk smerte (hodepine, magesmerter, muskel- og skjelettsmerter) var 50.9% blant alle deltakerne. Andelen av de som rapporterte kronisk smerte var høyere blant de som hadde opplevd overgrep og/eller omsorgssvikt (offer for vold, offer for vold i familien, seksuelt misbruk, vitnet vold, belastede hjemmeforhold). Den største forskjellen var mellom de som hadde og ikke hadde opplevd seksuelt misbruk, og overgrep/omsorgssvikt forklarte mer av variansen i muskel- og skjelettsmerter enn hodepine og magesmerte. Jenter var i større grad utsatt for overgrep/omsorgssvikt enn gutter, og jenter rapporterte høyere forekomst av alle smertetilstandene. Kjønn virker å redusere styrken på assosiasjonen mellom seksuelt misbruk og hodepine, seksuelt misbruk og magesmerte og belastede hjemmeforhold og magesmerter. Kjønn styrket assosiasjonen mellom offer for vold og magesmerte. Depresjon påvirket i stor grad den observerte assosiasjonen mellom seksuelt misbruk og alle smertevariablene, mens angst påvirket seksuelt misbruk og muskel- og skjelettsmerter.

Konklusjon: Det var høy forekomst av overgrep/omsorgssvikt og kronisk smerte blant ungdommene i barnevernsinstitusjon. Det var også en assosiasjon mellom disse. Kjønn, depresjon og angst påvirket denne assosiasjonen i enkelte av analysene. Funnene understreker viktigheten av å oppdage hendelser av overgrep og omsorgssvikt, samt kronisk smerte i barnevernspopulasjonen for å gi bedre hjelp og for å forebygge videre tilfeller for å redusere negative langtidseffekter.

Abstract

Background: Adolescents in residential youth care (RYC) are a population with higher prevalence of adversities and they are considered to be a group of high risk for impaired mental and physical health. Negative life experiences and health complaints have been associated in earlier research. Still, knowledge of the complex relationship of chronic pain and adversities in this group of adolescents is limited. The aim of this study was to investigate the prevalence of chronic pain across exposure to different adversities and the possible influence of sex and psychiatric disorder in adolescents in the RYC.

Methods: This study was part of a large, nationwide study of the RYC in Norway, administered at the Regional Centre for Child and Youth Mental Health and Child Welfare (RKBU), Central Norway. All RYC institutions holding residents in the age of 12 to 20 were invited to participate. Among the 86 institutions, with 601 residents, whom wanted to participate, a total of 400 adolescents/parents gave their consent (67% of eligible/invited adolescents). Information about chronic pain and psychiatric diagnosis (DMS-IV), as well as most of the information regarding childhood adversities, was assessed and evaluated using the Child and Adolescent Psychiatric Assessment (CAPA) interview.

Results: The prevalence of chronic pain (headache, abdominal pain, musculoskeletal pain) in the total sample was 50.9%. The percentage of individuals experiencing any pain is higher for those who had been victim of an adversity (victim of violence, victim of family violence, sexual abuse, witnessed violence, household dysfunction). The greatest differences were found between those who had or had not experienced sexual abuse, and adversities seemed to explain more of the variance in musculoskeletal pain, than headache and abdominal pain. Girls seemed to be exposed to adversities to a greater degree than the boys and girls reported higher prevalence of all chronic pain categories than boys. Sex appeared to reduce the effect seen of sexual abuse to headache, sexual abuse to abdominal pain, and household dysfunction to abdominal pain. Sex appeared to be a suppressor variable looking at victim of violence and abdominal pain. Depression had a large effect on the relationship between sexual abuse and all the pain variables, and anxiety on sexual abuse and musculoskeletal pain.

Conclusion: In this study, there was a relatively high prevalence of childhood adversities and chronic pain in the RYC population, and there was an association between the two. Sex, depression and anxiety seemed to influence the relationship in particular cases. These findings underline the importance of detecting exposure to childhood adversities and chronic pain in adolescents in the RYC, provide targeted treatment, as well as prevent further exposure to adversities. This to reduce poor long-term outcomes.

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Background

Child abuse is recognized as a global public health problem and a global social problem (Ajilian Abbasi, Saeidi, Khademi, Hoseini, & Emami Moghadam, 2015). Several children and adolescents are unable to live with their biological families due to concerns regarding their safety and welfare. These children and adolescents are often placed in out-of-home care by the Child Welfare Service (Bufdir, 2020a). In Norway, 2019, 4% of children and adolescent between the age of 0 and 22 years received help from the Child Welfare Service, and 39% of these had out of home placement status (Bufdir, 2020b). Removal from home is only an option when there are serious concerns about the child's conditions (Bufdir, 2016). This population is characterized by higher prevalence of childhood adversities and maltreatment in forms such as neglect, and physical and sexual abuse (Simms, Dubowitz, & Szilagyi, 2000). In addition, they are more likely to have a family history of mental illness (McMillen et al., 2005). With such background, this group is considered to be at high risk for mental and physical health problems. A higher prevalence of mental health problems among the out-of-home care population is well documented (Greger, Myhre, Lydersen, & Jozefiak, 2015; McMillen et al., 2005).

A report of psychological health of children and adolescents in Norway estimated that 8% met the criteria to at least one psychiatric diagnosis at some point between the age of 3 and 18 years (Mykletun, Knudsen, & Mathiesen, 2009). This is in contrast to the residential youth care population (RYC) where 76.2% met the criteria to one or more DSM-IV diagnosis (Greger et al., 2015). In a Health Survey completed at the Department of Child and Adolescent Psychiatry (CAP) in Norway, 566 of the 717 participants were diagnosed with a psychiatric disorder (Mangerud, Bjerkeset, Lydersen, & Indredavik, 2013). This shows that the RYC group seems to resemble the clinical population more than the general population. Mood disorders, anxiety disorders, and hyperkinetic disorders were found to be the most common mental health problems in the CAP group (Mangerud et al., 2013).

In two studies from Norway and one from the U.S. between 26% and 33% of the general population reported exposure to at least one type of potential traumatic event (PTE) (Amstadter, Aggen, Knudsen, Reichborn-Kjennerud, & Kendler, 2013; Stensland, Dyb, Thoresen, Wentzel-Larsen, & Zwart, 2013; Turney & Wildeman, 2017). Whereas from the CAP sample 87% of the participants reported they had experienced at least one potentially traumatic event in their life (Granseth, 2016) and 75% of the U.S. children placed in or adopted from foster care had such an experience (Turney & Wildeman, 2017).

Childhood adversity

There is no universal definition of childhood adversity (Greger, 2017). Adverse Childhood Experiences Study characterized adversities into emotional, physical or sexual abuse, emotional or physical neglect, or household challenges defined by a violent home environment, substance abuse in the household, mental illness in the household, parental separation or divorce, or a criminal household member (Felitti et al., 1998). A review of tools for measuring exposure to adversities in children and adolescents refers to the same categories in addition to "other adversities" covering community violence, discrimination, medical conditions, separation from parents such as foster care and other less common experiences (Oh et al., 2018). This thesis will refer to childhood adversity as the potentially traumatic events witnessing violence, being a victim of physical violence including violence by a family member, being a victim of sexual abuse, or experiencing household dysfunction including parents with psychiatric problems, parents with alcohol or drug abuse, or parental criminality.

Hel-BUP and Ung-HUNT demonstrates that an extensive part of the population experience potentially traumatic experiences. In these studies 87% and 80% of the participants had experienced at least one potentially traumatic event in their life up until entering the study (Granseth, 2016). Experiences such as serious illness in the family, death of someone close, serious accident, witnessed violence, victim of violence, victim of sexual assault, being threatened, painful or scary treatment at the hospital, and other scary, dangerous or violent experience were mapped. Several of these experiences would be categorized as adversity and maltreatment. Also, in a study based on the same sample as the present study, 71% of the adolescents reported exposure to maltreatment (witnessed violence, victim of physical violence or victim of sexual assault) (Greger et al., 2015).

Epidemiology.

The prevalence of adversity and household dysfunction varies between countries. A systematic review of prevalence of past year violence (physical violence, emotional violence, sexual violence, bullying, or witnessing violence) against children based on studies from 96 different countries found 64% incidents in Asia, 56% in Northern America, 50% in Africa, 34 in Latin America and 12% in Europe (Hillis, Mercy, Amobi, & Kress, 2016). The results of a prevalence research of adverse childhood experiences in the US children population showed that 22.5% experienced economic hardship, 21.9% parent separation, 7.1% had lived with someone who was mentally ill, suicidal or depressed, 8.1% lived with someone with a drug or alcohol problem, 3.3% had been victims of or witnessed violence in the neighborhood and 3.3% had been treated unfairly because of their race (Crouch, Probst, Radcliff, Bennett, &

McKinney, 2019). A Norwegian national survey mapping the occurrence of violence and sexual abuse in a group of 2062 16- and 17-year olds reported that 9.6% had experienced any form of physical violence and 6.6% had experienced psychological violence from a parent. The numbers were even larger considering violence from others than parents, being one of ten girls and three out of ten boys, many victims of repeated episodes. Further, 8.5% reported one or more types of neglect, 3% had witnessed violence between parents, and 13.3% of the girls and 3.7 % of the boys had experienced some form for sexual assault (Myhre, Thoresen, & Hjemdal, 2015).

Exposure to more than one type of childhood adversity has been shown to be common amongst victimized children and youth, with an overlap between different types of adversities (Finkelhor, Ormrod, & Turner, 2007). The Norwegian survey looking at violence and sexual abuse in a group of youth as aforesaid found that youth exposed to violence were more likely to have experienced other potentially traumatic experiences. 45.5% of the girls and 29% of the boys who had been victim of violence had experienced more than one form of violence, and in addition these girls were also more likely to have experienced sexual violence (Myhre et al., 2015).

Childhood adversity and health issues.

A large meta-analysis by Norman et al. suggests a relationship between experiences like the ones described with health issues, including physical and psychological problems (2012). The Adverse Childhood Experiences study was the first large study to demonstrate a link between childhood adversity and later psychiatric and physical issues (Edwards, Holden, Felitti, & Anda, 2003; Felitti et al., 1998). Adding to this, children who had witnessed violence in family relations reported more physical health complaints, including pain, compared to those who had not (Lamers-Winkelman, Schipper, & Oosterman, 2012). Such studies suggest an influence of psychosocial factors on psychological and physical health, including pain, factors that are likely to have been present in many of the RYC adolescents' lives.

Physical health and chronic pain

Some studies have demonstrated a high prevalence of physical health problems among the out-of-home care population. One report described rates varying from 30% to 80% of children entering foster care to have at least one physical health problem, with one third having a chronic health condition. In addition, it described high rates of clinically mental health problems (54%) and chronic medical illness (30%) for youth transitioning out of foster

care (Szilagyi, Rosen, Rubin, & Zlotnik, 2015). The Adverse Childhood Experiences (ACE) study showed a significant association between adverse childhood experiences and poor physical health in adulthood, this included ischemic heart disease, cancer, chronic lung disease and chronic pain conditions (Felitti et al., 1998) and provides information about the potential effect such experiences can have for an individuals' health. The physical health of youth in foster care is in general reported to be poorer compared to the equivalent group in the general population, with higher rates of illnesses such as severe allergies, asthma, eczema and recurrent era infections (Jee et al., 2006), health issues that may reflect past traumatic experiences and neglect. Another study, with the same sample as the present study indicated that adolescents in RYC experienced their physical health to be more impaired compared to both the general population and the adolescent outpatients in the Child and Adolescent Mental Health Services (CAMHS) (Jozefiak & Kayed, 2015). Although there are studies indicating impaired physical health in the out-of-home care population, few studies have investigated the prevalence of chronic pain in residential youth care and general out-of-home care population. What is known, is that those who suffer from psychiatric disorders are burdened with a higher prevalence of chronic illness and pain, however there is more evidence for the adult population than among adolescents (Huffhines & Jackson, 2019; Mangerud et al., 2013).

Pain definition and prevalence.

Task force on taxonomy of the International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Merskey & Bogduk, 1994). Chronic pain has been recognized as pain that is persistent and recurrent, occurring at least once a week for at least three months (Mangerud et al., 2013; Merskey & Bogduk, 1994).

In Norway, research on the prevalence of chronic pain in children and adolescents is limited. One study, the Health Interview Survey of 2005, where parents reported chronic pain symptoms for their children, 6% of children aged 6-10 years and 12% adolescents aged 11-15 years, reported to have symptoms (Berg, Steingrimsdottir, & Nielsen, 2011). Another study of 12-15 years old adolescents in Trøndelag revealed that 17% suffered regularly from headaches, abdominal pain, back pain or pain in arms or legs (Larsson & Sund, 2007).

A systematic review by King et al. showed that chronic and recurrent pain is common among children and adolescents, although prevalence studies have yielded inconsistent results. Rates varied for headache 8-83%, abdominal pain 4-53%, back pain 14-24%, musculoskeletal pain 4-40%, multiple pains 4-49% and other pains 5-88% (2011). The most common somatic health complaints among children and adolescents are headache, abdominal

pain and musculoskeletal pain (Perquin et al., 2000). The same results were found in youth entering residential care (T. D. Nelson et al., 2011). A different review study observed a tendency of poorer family functioning in families with children suffering from chronic pain compared to a healthy population, and there has been found an association between family factors and the presence of chronic pain (Lewandowski, Palermo, Stinson, Handley, & Chambers, 2010). Children and adolescents with chronic pain are more likely to have chronic pain conditions when they become adults (King et al., 2011). Today, the majority of pain research on youth stems from examinations in pain clinics, yet research has suggested that only 2% of pain sufferers attend a pain clinic and most of the cases are managed in primary care (Huffhines & Jackson, 2019).

Sex differences.

There is a large body of literature regarding sex differences in pain suggesting that pain sensitivity and risk for clinical pain is more often observed in women than men. A review by Bartley and Fillingim of epidemiological and clinical findings describes that research consistently demonstrates women to be at substantially higher risk for many common pain conditions. They conclude that women exhibit greater pain sensitivity, enhanced pain facilitation and reduced pain inhibition compared to men, though the magnitude of difference varies across studies. Some evidence suggest that women experience more severe clinical pain, however findings regarding pain severity are less consistent (Bartley & Fillingim, 2013). Women consistently report lower pain thresholds, lower pain tolerance, and greater unpleasantness with pain (Wise, Price, Myers, Heft, & Robinson, 2002). The specific basis underlying these differences are unknown, and there are most likely several biological and psychosocial processes contributing. Psychosocial processes such as pain coping and early-life exposure to stress, as well as stereotypical gender roles may explain the differences in pain expression (Bartley & Fillingim, 2013).

Most of the research regarding sex differences in chronic pain has been conducted in the adult population. A systematic review of sex differences in children discovered inconsistent findings, but summarized that most studies on healthy children's responses to pain reported no significant differences on any pain related outcomes (Boerner, Birnie, Caes, Schinkel, & Chambers, 2014). Yet, the meta-analysis found that girls reported significantly higher increased pain intensity compared to boys when the mean age was greater than 12 years (Boerner et al., 2014). It seems to be a consistent finding that the prevalence is greater among girls and that the differences emerge around pubertal development (King et al., 2011).

Chronic pain and psychiatric disorders.

An association between physical pain and psychiatric problems has been well documented. Adolescents in long-term foster care with chronic illness self-reported significantly greater internalizing problems than those without a chronic illness. Their caregivers also reported this group to have higher rates of internalizing problems as well as greater overall behavior problems (Woods, Farineau, & McWey, 2013). It has been observed a stronger relationship between somatic complaints and affective disorders in girls than in boys, while the association between disruptive behavior disorders and somatic complaints has been found to be stronger for boys than for girls (Egger, Costello, Erkanli, & Angold, 1999).

In a study of patients in the Norwegian CAMHS, chronic pain was found in 70% percent of the adolescents who had a psychiatric disorder (N = 566), a higher rate than the general population. The highest prevalence was found in those with mood (79%) and anxiety (76%) disorder, where musculoskeletal pain was the most frequent type (66% and 64% respectively). Among those with hyperkinetic disorders musculoskeletal pain were the most prevalent pain conditions (55%) (Mangerud et al., 2013). Some research indicate different pain locations across different psychiatric disorders, others argue that the association depends on the frequency and coexistence of multiple frequent pains rather than pain or localization (Larsson & Sund, 2007).

Adolescent childhood adversities and chronic pain

A review article of adverse childhood experiences and pain literature describes that this relationship have mostly been studied in retrospect in adults (S. M. Nelson, Cunningham, & Kashikar-Zuck, 2017). A few studies in youth have suggested that ACEs are reported more often by children and adolescents with pain syndromes than their healthy peers (Kerker et al., 2015; S. M. Nelson et al., 2017). However, little is known about how the adversities may impact concurrent or long-term outcomes in youth with chronic pain (S. M. Nelson et al., 2017). The ACE study show the association between adverse experiences and chronic conditions to be frequently dependent, indicating that a higher number of adversities lead to greater severity of chronic health concerns as an adult (Felitti et al., 1998). A U.S. study found that maltreatment history was associated with chronic pain while maltreatment frequency and acute pain was unrelated, demonstrating a difference between brief instances of pain compared to chronic pain (Huffhines & Jackson, 2019). There is a clear need for research of youths' experience of maltreatment and subsequent chronic pain before reaching adulthood (Huffhines & Jackson, 2019).

The Biopsychosocial model

Today the predominant perspective to the understanding of pain is the biopsychosocial model. The model offers an integrative view of pain incorporating biological, psychological and social factors impacting the pain experience and further contributing to interpersonal variability. It gives a framework to better understand the relationship between psychological issues and somatic pain symptoms as it focuses on pain perception being influenced by the complex and dynamic interaction of biological (*for example genetic, neurobiological, HPA axis, neuroendocrine*), psychological (*for example subjective experience of pain, affective components, coping abilities*), and social (*for example peer and family environment, social learning*) factors (Gatchel, Peng, Peters, Fuchs, & Turk, 2007; S. M. Nelson et al., 2017).

Many of the biological, psychological and social constructs are thought to be related to adverse childhood experiences in children and adolescents as well (Kerker et al., 2015). Although the model explains the existence of mediating factors it does not itself indicate the degree of influence of the different variables. There is also a potential of a bidirectional relationship between maladaptive outcomes. In light of evidence suggesting a relationship between ACE and increased risk of chronic pain, it would be interesting to look further into the complex relationship of adverse experiences and biopsychosocial factors to better understand the risk ACEs' may have on chronic pain in child and adolescent (S. M. Nelson et al., 2017). It is known that exposure to adversities may be related to broader health outcomes (Felitti et al., 1998) and research on risk factors have been studied greatly in adult pain populations, however, the commonalities between ACEs and pediatric chronic pain in these biopsychosocial areas have not been systematically investigated (S. M. Nelson et al., 2017).

To sum up, negative life experiences and health complaints, including chronic pain and psychiatric disorders have been associated in previous studies. Children and adolescents in RYC seem to be a population with higher prevalence and impact of negative life experiences, as well as being at higher risk for psychiatric illness (Greger et al., 2015; Jozefiak et al., 2016). Further, there is a great chance that children and adolescents placed in RYC has been exposed to psychosocial factors that may affect their potential pain experience. A biopsychosocial model works as a framework to better understand the complex relationship between somatic pain, psychological issues and the social factors regarding placement in RYC. To the author's knowledge no studies have investigated the associations of childhood adversities, somatic pain and psychiatric disorder in the RYC population, even though this is a population at risk for both impaired mental and physical health.

Aim and research questions

The aim of the thesis is to explore the associations between childhood adversities and chronic pain in the RYC population and whether sex and presence of a psychiatric disorder influence these associations. By exploring this, the thesis aims to further map the needs of and increase the understanding of this population. Research objectives that will be addressed are;

is exposure to different childhood adversities associated with presence of chronic pain in the RYC population?

does sex influence the association between childhood adversities and chronic pain in the RYC population?

does presence of a psychiatric disorder influence the association between childhood adversities and chronic pain in the RYC population?

Method

Procedures

Data was collected through "Mental health in children and adolescents in child welfare institutions" (Kayed et al., 2015), a cross-sectional study of youths in RYC institutions. This data collection was done between June 2011 and July 2014, and carried out by four trained research assistants in the respective institutions. Rather agreement was performed and evaluated for these research assistants. Each youth was personally interviewed with a structured psychiatric interview, Child and Adolescent Psychiatric Assessment (CAPA), however, not all the residents were able to complete the CAPA due to its length.

Participants

All residential youth care institutions in Norway hosting adolescents in the age of 12 to 23 years were invited to participate in the main study (see Figure 1). Unaccompanied minors without asylum in Norway and youths in acute placement were excluded due to their vulnerable situation, in addition to those with too insufficient language skills in Norwegian to be interviewed. There were 163 institutions ($N = 1600$) total, where 98 ($N = 731$) were eligible and 86 ($N = 601$) of these institutions with eligible youths wanted to participate. Some parents or youths did not consent to participate ($N = 201$) and the final response rate turned out to be 67%, giving a total sample of 400. This final sample consisted of adolescents between 12 and 20 years including 230 girls (mean age = 16.9; $SD = 1.2$) and 170 boys (mean age = 16.5; $SD = 1.5$). Out of these adolescents, 335 completed the psychiatric interview, while 330 completed the CAPA.

To reduce the possibility of a non-representative data sample an analysis of the CBCL data of the participants as well as 141 anonymous non-participants were performed. A Bayesian multiple imputation (MI) showed a modest difference between these two groups, confirming the representativeness of the participants (Jozefiak et al., 2016). See Jozefiak et al. (2016) for further information.

Figure 1

Inclusion flowchart. Retrieved from Jozefiak et al. (2016) analysis. *CAPA* Child and Adolescent Assessment Interview, *CBCL* Child Behaviour Checklist, *primary contact* child's individual primary contact at the institution. *"Not able to contact" was used if institutional staff did not respond to repeated approaches about participation over a period of several months. **There were no significant differences between participating and non-participating RYC institutions with regard to geography and ownership.
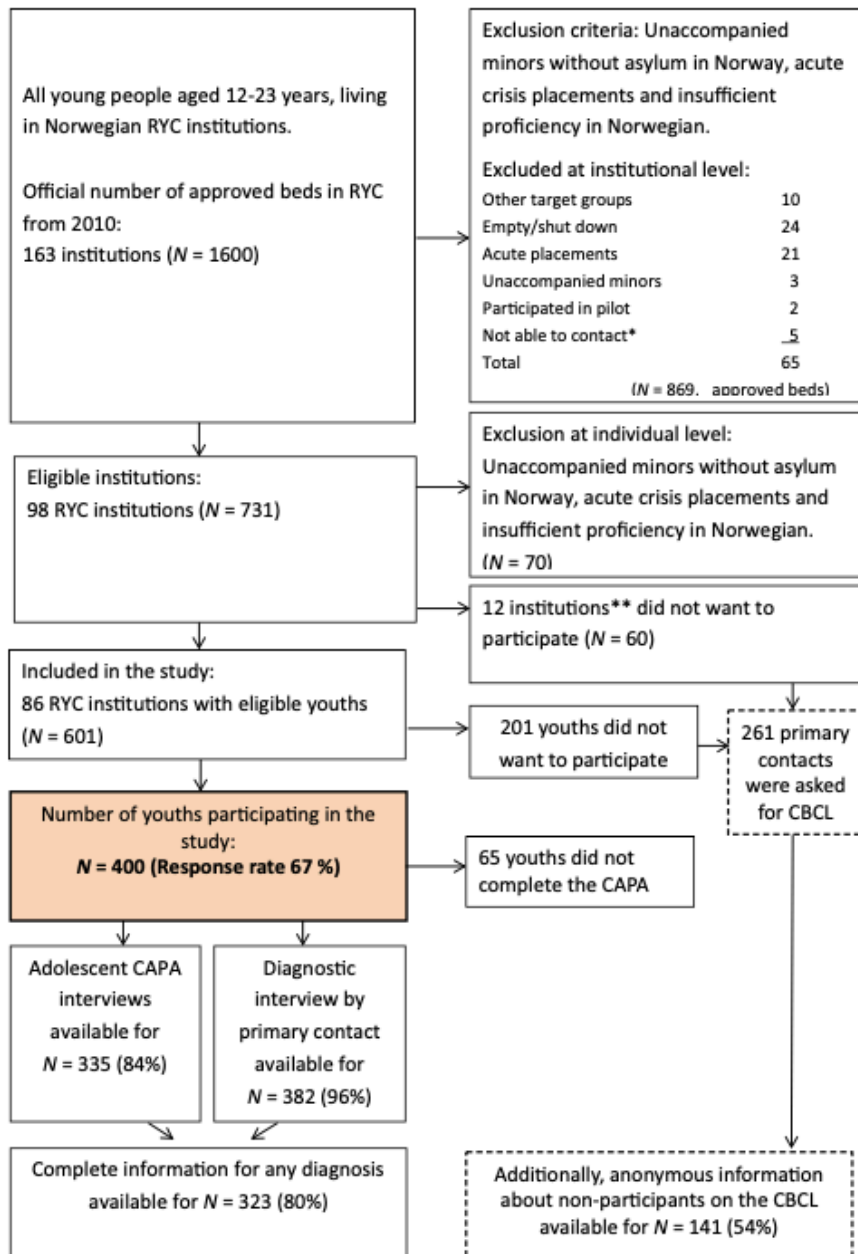
Instruments

CAPA.

Sociodemographic.

Sociodemographic characteristics such as age and sex were reported.

Psychiatric disorders.

The psychological health of the adolescents was evaluated using the Child and Adolescent Psychiatric Assessment (CAPA) interview. CAPA is a standardized, semi-structured psychiatric diagnostic interview designed for children and adolescents. Through information regarding onset, duration, intensity and frequency of symptoms, functional impairment was evaluated, and psychiatric diagnoses were given in accordance with DSM-IV criteria (Angold & Costello, 2000). Test-retest reliability for diagnoses have been good, ranging from kappa=0.55 for conduct disorder to kappa=1.0 for substance abuse/dependence, and validity has been judged as good (Angold & Costello, 2000).

The variables are organized in *attention deficit hyperactivity disorder (ADHD)*, *anxiety disorders* (GAD, panic disorder, agoraphobia and social phobia), *depressive disorders* (depressive disorder, dysthymia and depressive disorder Not Otherwise Specified) and *behavior disorders* (conduct disorder and oppositional defiant disorder). Based on the information from CAPA a computer-based algorithm for diagnostic evaluation produces the DSM-IV diagnosis.

The adolescents were themselves interviewed with the exception for ADHD, where information about symptoms and diagnostic criteria of ADHD was obtained from the youths' primary contact at the institution, using the Parent version of the CAPA interview (Angold & Costello, 2000). The obtaining of information through primary care contacts was based on concerns regarding reliability of self-report in the assessment of ADHD. (Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007). A previously given ADHD diagnosis was accepted even when the symptoms were subthreshold, given the possible effects of medication or therapy.

Chronic pain.

In addition to psychiatric symptoms, CAPA includes a non-standardized somatization module for physical symptoms, with questions regarding the onset, duration, frequency, medical assistance, school or work absence, and functional impairment. *Pain* was measured by experienced pain by the adolescent not related to known disease or injury in the past 3 months. Further, c*hronic pain* was defined as having pain for a duration of minimum 1 hour, once a week, persisting every week over the last three months. The subjects were asked about the most common types of pain; *headache*, *abdominal pain* and *musculoskeletal pain*

(Perquin et al., 2000). This was measured through a non-standardized somatization module for physical symptoms in CAPA. The pain intensity for headache and abdominal pain was rated as either "no pain" or "pain with a duration for a minimum of 1 hour, minimum once each week, and that has persisted every week for the primary period (last 3 months)", and musculoskeletal pain as "no pain", "pain for a minimum of 3 times a week in the primary period" or "pain is present almost at all times". For musculoskeletal pain, the two last values were merged in order to compare the scores of the three chronic pain variables.

Childhood adversities.

Information about childhood adversity, was primarily from the CAPA. The questions concerned whether the subject had been *witness of violence* (saw or heard, but was not the subject of, an event with potential for life-threatening or severe physical injury)*, victim of physical violence* (was the victim of physical violence, with one or more people (not a family member) using force against him/her with potential to cause death or serious injury)*, victim of familial physical violence* (was the victim of physical abuse by a member of the family)*, or victim of sexual abuse* (a sexual abuse episode or episodes occurred in which a person involved the child in activities for the purpose of the perpetrators own sexual gratification). To these questions they responded to whether they had ever experienced the event and to whether they had experienced the event in the past three months. Their responses indicated whether they had experienced the defined event and if so, who was involved (nature of relationship to the involved part) and to what degree the event was experienced harmful. To all these adversities a positive response, regardless of who was involved and to what degree the event was harmful, was coded positive on a yes-or-no scale for the analysis.

In addition, there is a variable *household dysfunction* based on answers from a questionnaire (Appendix C) regarding their first removal from the family. The variable was constructed from the items *reason for removal* due to *parents' drug problem, parents' alcohol problem, parents' psychiatric disorder/problem, parents' problem with criminality* («yes» or «no» answers)*. A positive answer to at least one of these gave a positive score on *household dysfunction.*

Statistical analysis

Pearson's Chi-square test was performed to analyze the relationship between the childhood adversities and pain status in the participants. All variables were dichotomous, present or non-present for both pain and the childhood adversities. The same tests were also completed for each sex separately.

Next, logistic regressions were applied to further investigate the effects on chronic pain. The dependent variables were dichotomous, pain or no pain. Separate analyses were performed for each of the chronic pain variables: abdominal pain, headache and musculoskeletal pain. Analyses were also performed for each one of the adversity variables. These were entered in step one. Subsequently age, sex, both age and sex, or one after one of the different psychiatric disorders were entered in step two to adjust the model. This enabled analysis of the odds of pain in different adversity categories, after adjusting for age, sex, and psychiatric diagnosis.

Missing data was handled by available case analysis, meaning cases with partially missing data were disregarded from the particular analysis. Descriptive statistics are reported as frequencies (percentages) for categorical data and mean (standard deviation, SD) for continuous data. *P*-values of <0.05 were considered statistically significant, and 95% confidence intervals are reported where relevant. The data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.

Ethics

The main study and the present study were approved by the Norwegian Committee for Medical and Health Research Ethics (Number of reference: 2010/1965/REK midt) (see Appendix B). The main study was completed according to REK's guidelines and requirements, and data in the present study was handled in accordance with guidelines given by REK and «Mental health in children and adolescents in child welfare institutions». The participants were recruited using approved procedures, written informed consent was obtained from every participant, and for the participants under the age of 16, consent was also obtained from the adolescent's guardian, and guidelines for anonymity were compiled. To be able to compare participants and non-participants the acquisition of anonymous CBCL scores with accompanying information about age and sex for non-participants was also approved.

Results

Frequencies of chronic pain, childhood adversities and psychiatric disorders

The participants characteristics are presented in Table 1. In the total sample (n= 330), 50.9% reported chronic pain. More specifically, 32.5% reported headache, 21.1% reported abdominal pain and 26.7% reported musculoskeletal pain (see Table 1). Further, among the participants whom had experienced an adversity (n= 243), 100% reported chronic pain, and 63.1% reported headache, 41.7% reported abdominal pain and 56.0% reported musculoskeletal pain (see Table 2).

Table 1

Characteristics of participants

	Girls	**Boys**	**Total**
Number	206 (57.5%)	151 (42.5%)	358
Age (years) (n= 357)			
Mean (SD)	16.5 (1.21)	16.0 (1.47)	16.3 (1.35)
Range	13-20	12-19	12-20
Adversities			
Any adversity	162/189 (85.7%)	81/127 (63.8%)	243/316 (76.9%)
Victim of violence	39/194 (20.1%)	42/136 (30.9%)	81/330 (24.5%)
Victim of family violence	91/193 (47.2%)	38/136 (27.9%)	129/329 (39.2%)
Victim of sexual assault	80/191 (41.9%)	9/133 (6.8%)	89/324 (27.5%)
Witnessed violence	50/193 (25.9%)	41/134 (30.6%)	91/327 (27.8%)
Household dysfunction	69/206 (33.5%)	22/152 (14.5%)	96/399 (24.1%)
Chronic pain			
Any pain	118/194 (60.8%)	50/136 (36.8%)	168/330 (50.9%)
Headache	80/196 (40.8%)	28/136 (20.6%)	108/332 (32.5%)
Abdominal pain	59/195 (30.3%)	11/136 (8.1%)	70/331 (21.1%)
Musculoskeletal pain	65/195 (33.3%)	30/136 (22.1%)	95/331 (26.7%)
Psychiatric disorder			
Any depressive disorder	94/197 (47.7%)	31/138 (22.5%)	125/335 (37.3%)
Any anxiety disorder	80/197 (40.6%)	37/138 (26.8%)	117/335 (34.9%)
ADHD – total	67/206 (32.5%)	62/152 (40.8%)	129/358 (36.0)
Any behavioral disorder	30/197 (15.2%)	40/138 (29.0%)	70/335 (20.9%)

Note. % reported in "valid percent". Any depressive disorder = at least one of the following diagnoses: MDD, dysthymia, depression not otherwise specified. Any anxiety disorder = at least one of the following diagnoses: GAD, panic anxiety, agoraphobia, specific phobia, social phobia. Any behavior disorder = at least one of the following diagnoses: CD, ODD

Table 2

Frequency of chronic pain and pain location across adversities

	Total sample *n*= 400	Headache *n*= 332	Abdominal pain *n*= 331	Musculoskeletal pain *n*= 331	Any type of pain *n*= 330
Total sample ***n*= 400**		108	70	95	168
Victim of violence ***n*= 330**	81	29/81 (35.8%)	21/81 (25.9%)	32/81 (39.5%)	49/81 (60.5%)
Victim of family violence ***n*= 329**	129	49/129 (38%)	31/129 (24%)	41/128 (32%)	73/128 (57.0%)
Victim of sexual abuse ***n*= 324**	89	37/89 (41.6%)	25/89 (28.1%)	39/88 (44.3%)	60/88 (68.2%)
Witnessed violence ***n*= 327**	91	34/91 (37.4%)	22/90 (24.4%)	32/90 (35.6%)	54/89 (60.7%)
Household dysfunction ***n*= 399**	96	32/87 (36.8%)	32/87 (36.8%)	24/86 (27.9%)	51/85 (60%)
Any type of adversity ***n*= 316**	243	106/168 (63.1%)	70/168 (41.7%)	94/168 (56.0%)	168/168 (100%)

Note. Table 2 shows how many individuals experience chronic pain when they have been victim of different adversities. 108 adolescents reported to have chronic headache (*n*=332), 70 reported chronic abdominal pain (*n*=331), 95 reported chronic musculoskeletal pain (*n*=331), and 168 reported to have any of the three pain categories.

Frequencies of chronic pain, adversities and psychiatric disorders for boy and girls separate

Looking at the characteristics of the participants (see Table 1), more girls than boys are represented. Further, girls seem to be exposed to adversities to a greater degree than the boys, greatest difference being for sexual abuse. The boys report a higher prevalence than girls to victim of violence and witnessed violence. Also, for chronic pain the girls report higher prevalence for pain categories, the greatest relative difference being found for abdominal pain where it is more than three times greater. Lastly, looking at psychiatric diagnosis girls were diagnosed with a depressive disorder and anxiety disorder much more frequently than the boys, while the opposite holds for ADHD and behavioral disorder.

Associations between adversities and chronic pain

Cross tables for adversities and pain are shown in Table A1 in Appendix. The results show that in all cases the percentage of individuals experiencing any pain is higher for those who had experienced an adversity. In several cases the difference is quite small, whereas for some it is much larger. Looking at the specific pain locations and adversities (see Table 2, and Table A1 in Appendix) the greatest difference is found for sexual abuse and musculoskeletal

pain, with 44.3% (39/88) of the sexually abused reporting pain, versus 22.4% (52/232) (*p*<.001) of the non-sexually abused. Further, 39.5% (32/81) of the victims of violence report musculoskeletal pain, compared to 24.9% (61/245) (*p*=.012) of the non-victims, and 41.6% (37/89) of the sexually abused report headache, versus 29.3% (68/232) (*p*=.036) of those not sexually abused. These findings were also statistically significant. Next, among those who witnessed violence 35.6% (32/90) reported musculoskeletal pain, compared to 26.2% (61/233) who had not (*p*=.095), and then 28.1% (25/89) of the sexually abused reported abdominal pain, versus 19% (44/231) (*p*=.078) non-abused adolescents. Another significant observation was for those who were victim of household dysfunction where 27.9% (24/86) reported musculoskeletal pain, in contrast to 18.8% (46/245) (*p*=.043) who had not been victim of household dysfunction. This demonstrates a trend where the greatest differences were found between those who had or had not experienced sexual abuse. Further, another tendency appears to be that adversities explain more of the variance in musculoskeletal pain than headache and abdominal pain.

Age and sex as control variables

Logistic regression was used to analyse the odds ratio (OR) of pain in different adversities when controlling for age and sex. When adding age and sex to the equation the trend seems to be that age has a minor effect on the odds ratios, while adding sex leads to a stronger change (see table 3).

Table 3

Prevalence of chronic pain related to different forms of adversities.

OR compared to unexposed, adjusted for sex, age and psychiatric diagnosis, one variable at a time.

Adversities	Headache		Abdominal pain		Musculoskeletal pain	
	OR (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*P*
Victim of violence	1.18 (0.70, 2.00)	.541	1.44 (0.80, 2.59)	.228	**1.97 (1.16, 3.35)**	**.012**
Adjusted for sex	1.38 (0.80, 2.39)	.249	**1.90 (1.01, 3.59)**	**.047**	**2.22 (1.28, 3.83)**	**.004**
Adjusted for age	1.17 (0.69, 1.99)	.551	1.42 (0.79, 2.55)	.249	**1.94 (1.14, 3.31)**	**.014**
Adjusted for sex and age	1.40 (0.80, 2.42)	.237	**1.90 (1.01, 3.59)**	**.048**	**2.19 (1.27, 3.79)**	**.005**
Adjusted for depression	0.95 (0.54, 1.67)	.864	1.23 (0.67, 2.26)	.514	**1.80 (1.05, 3.10)**	**.033**
Adjusted for anxiety	1.03 (0.60, 1.79)	.904	1.29 (0.70, 2.36)	.412	**1.79 (1.04, 3.10)**	**.036**
Adjusted for ADHD	1.17 (0.69, 1.99)	.557	1.46 (0.81, 2.63)	.210	**1.94 (1.14, 3.32)**	**.015**
Adjusted for behavior disorder	1.13 (0.66, 1.92)	.666	1.03 (0.53, 1.98)	.939	1.31 (0.81, 2.14)	.273
Victim of family violence	1.47 (0.92, 2.35)	.109	1.27 (0.75, 2.17)	.376	1.20 (0.73, 1.98)	.473
Adjusted for sex	1.25 (0.77, 2.03)	.368	0.95 (0.56, 1.72)	.948	1.14 (0.69, 1.88)	.618
Adjusted for age	1.51 (0.94, 2.43)	.089	1.24 (0.72, 2.14)	.430	1.29 (0.79, 2.12)	.308

	OR (CI)	p	OR (CI)	p	OR (CI)	p
Adjusted for sex and age	1.30 (0.80, 2.13)	.289	0.98 (0.56, 1.73)	.949	1.20 (0.72, 1.98)	.485
Adjusted for depression	1.51 (0.94, 2.43)	.089	0.98 (0.56, 1.73)	.983	1.12 (0.67, 1.86)	.668
Adjusted for anxiety	1.25 (0.77, 2.03)	.376	1.07 (0.61, 1.86)	.812	1.37 (0.84, 2.25)	.208
Adjusted for ADHD	1.49 (0.93, 2.38)	.099	1.24 (0.73, 2.13)	.428	1.33 (0.82, 2.17)	.252
Adjusted for behavior disorder	1.36 (.77, 2.39)	.288	1.29 (0.75, 2.20)	.359	1.31 (0.81, 2.14)	.273
Sexual abuse	**1.72 (1.03, 2.85)**	**.037**	1.66 (0.94, 2.93)	.080	**2.76 (1.64, 4.64)**	**<.001**
Adjusted for sex	1.20 (0.69, 2.08)	.516	0.97 (0.53, 1.78)	.925	**2.54 (1.44, 4.49)**	**.001**
Adjusted for age	**1.71 (1.03, 2.85)**	**.038**	1.62 (0.92, 2.86)	.097	**2.69 (1.60, 4.55)**	**<.001**
Adjusted for sex and age	1.20 (0.69, 2.08)	.514	0.97 (0.53, 1.78)	.923	**2.53 (1.43, 4.47)**	**.001**
Adjusted for depression	1.13 (0.65, 1.97)	.661	1.16 (0.63, 2.13)	.636	**2.35 (1.37, 4.06)**	**.002**
Adjusted for anxiety	1.33 (0.78, 2.28)	.293	1.31 (0.72, 2.37)	.374	**2.26 (1.31, 3.89)**	**.003**
Adjusted for ADHD	**1.70 (1.02, 2.84)**	**.041**	1.74 (0.98, 1.14)	.058	**2.66 (1.58, 4.50)**	**<.001**
Adjusted for behavior disorder	**1.70 (1.02, 2.82)**	**.042**	1.66 (0.94, 2.93)	.081	**2.73 (1.62, 4.60)**	**<.001**
Witnessed violence	1.28 (0.77, 2.13)	.337	1.25 (0.70, 2.22)	.453	1.56 (0.92, 2.62)	.097
Adjusted for sex	1.38 (0.82, 2.32)	.228	1.40 (0.77, 2.56)	.275	1.63 (0.96, 2.77)	.069
Adjusted for age	1.29 (0.81, 1.15)	.327	1.21 (0.67, 2.16)	.528	1.49 (0.88, 2.52)	.141
Adjusted for sex and age	1.44 (0.85, 2.45)	.176	1.21 (0.67, 2.16)	.528	1.58 (0.93, 2.70)	.094
Adjusted for depression	1.17 (0.69, 2.00)	.563	1.14 (0.63, 2.07)	.668	1.49 (0.88, 2.53)	.140
Adjusted for anxiety	1.21 (0.72, 2.05)	.467	1.17 (0.65, 2.12)	.596	1.50 (0.88, 2.57)	.138
Adjusted for ADHD	1.28 (0.77, 2.12)	.348	1.27 (0.71, 2.26)	.422	1.53 (0.91, 2.59)	.111
Adjusted for behavior disorder	1.25 (0.71, 2.21)	.441	1.23 (0.68, 2.21)	.500	1.49 (0.88, 2.55)	.142
Household dysfunction	1.29 (0.78, 2.16)	.325	1.68 (0.95, 2.96)	.076	**1.71 (1.02, 2.89)**	**.044**
Adjusted for sex	1.04 (0.61, 1.77)	.884	1.25 (0.69, 2.27)	.456	1.54 (0.90, 2.63)	.117
Adjusted for age	1.32 (0.79, 2.21)	.291	1.69 (0.95, 2.98)	.074	**1.72 (1.02, 2.91)**	**.043**
Adjusted for sex and age	1.06 (0.62, 1.81)	.838	1.26 (0.70, 2.29)	.443	1.56 (0.91, 2.67)	.106
Adjusted for depression	1.04 (0.60, 1.80)	.889	1.41 (0.78, 2.54)	.260	1.54 (0.90, 2.63)	.112
Adjusted for anxiety	1.18 (0.69, 2.00)	.548	1.54 (0.86, 2.76)	.149	1.60 (0.94, 2.74)	.086
Adjusted for ADHD	1.30 (0.78, 2.17)	.316	1.66 (0.94, 2.94)	.082	**1.75 (1.03, 2.97)**	**.037**
Adjusted for behavior disorder	1.32 (0.79, 2.21)	.290	1.70 (0.96, 3.00)	.071	**1.75 (1.04, 2.96)**	**.037**

Note. OR = odds ratio, CI = confidence interval

The chi-square test was also performed for each sex separate as well (see Table A2 in Appendix). When separating boys and girls only two of the analysis are significant being victim of violence and musculoskeletal pain for boys (*p*= .026) and household dysfunction and musculoskeletal pain when looking at girls (*p*= .025).

Looking at sexual abuse and headache the OR is reduced from 1.72 (*p*= .037) to 1.20 (*p*= .516) when controlling for sex. Looking at data for boys and girls separately, although not significant, the boys' numbers show an opposite trend than the girls. Their prevalence of

headache decreases when they have been victim of sexual assault. After controlling for sex, household dysfunction and headache show the same trend as OR is reduced from 1.29 (*p*= .325) to 1.04 (*p*= .884). Here, the percent for each sex remains unaltered after exposure to the adversity, although the girls have a double relative risk of pain. For sexual abuse and abdominal pain OR reduces from 1.66 (*p*= .080) to 0.97 (*p*= .925), in this case the boys' relative risk increases substantially compared to the girls'. Lastly, for household dysfunction and abdominal pain OR reduces from 1.68 (*p*= .076) to 1.25 (*p*= .456) when controlling for sex. In these cases, the observed effect of adversities to presence of pain disappears or is greatly reduced when controlling for sex, hence sex can be considered a confounder. In the other cases the OR stays almost the same after controlling for either age or sex.

Victim of violence and musculoskeletal pain OR 1.97 (CI 1.16 to 3.35), *p*=.012, and sexual abuse and musculoskeletal pain OR 2.76 (CI 1.64 to 4.64), *p*<.001, are both statistically significant, both before and after adjusting for age and sex. Other statistically significant results are sexual abuse and headache prior to adjusting for sex, OR 1.72 (CI 1.03, 2.85), *p*=.037, victim of violence and abdominal pain after adjusting for sex, OR 1.44 (CI 0.80 to 2.59), *p*=.228, and household dysfunction and musculoskeletal pain before adjusting for sex, OR 1.71 (CI 1.02 to 2.89), *p*=.044.

The opposite is observed for victim of violence and abdominal pain as OR increases from 1.44 (*p*= .228) to 1.90 (*p*= .047) when controlling for sex (see Table 3 and Table A2 in Appendix for the following results). In this case, sex is also a confounder, however a suppressor variable. Looking at boys and girls separately in this analysis risk ratio is about the same for boys and girls, while the risk difference is substantially greater for girls than boys. Girls who had been a victim of violence showed 16.1% (43.6%-27.5%) greater chance of abdominal pain than those who had not, but only 3% (9.5%-6.5%) greater chance for boys. Simultaneously, the relative risk (RR) is much closer (girls RR=1.59 (43.6/27.5), boys RR=1.46 (9.5/6.5)). There are small, but similar observations for victim of violence and musculoskeletal pain where OR increases from 1.97 (*p*= .012) to 2.22 (*p*= .004), the relative risk for the boys' doubles (33.3/16.3=2.0), while the girls' increases with about 50% (46.2/30.1=1.5). Girls have greater chances of musculoskeletal pain after being victim of violence. For victim of violence and headache OR increases from 1.18 (*p*= .541) to 1.38 (*p*= .249). Here, the relative risk almost doubles for boys (28.6/17.4=1.6) and remains almost the same for girls (43.6/40.9=1.1). Girls do still have a more pronounced likelihood of experiencing pain following exposure than boys. Lastly, for witnessed violence and abdominal pain where OR increases from 1.25 (*p*= .453) to 1.40 (*p*= .275). Boys' relative risk

is almost equivalent after witnessing violence (7.3/8.8=0.8), while the girls' increase (38.8/28.2=1.4). The girls' chance of abdominal pain increases notably compared to boys following exposure.

Psychiatric disorders as control variables

Logistic regression was used to analyse the odds of pain in different adversity categories, when controlling for different psychiatric diagnosis. Adjusting for psychiatric diagnosis depression has a large effect on the odds ratio looking at the relationship between sexual abuse and all the pain variables; for sexual abuse and headache the change in OR is 0.59, for sexual abuse and abdominal pain the change in OR is 0.50, and for sexual abuse and musculoskeletal pain the change in OR is 0.41. Further there is some change to victim of family violence and headache where the change in OR is 0.36, to victim of family violence and abdominal pain where the change in OR is 0.29, household dysfunction and headache with a change in OR of 0.25, and household dysfunction and abdominal pain with a change in OR of 0.27. Also, anxiety has a great effect on sexual abuse and musculoskeletal pain with a change in OR of 0.50, and some effect on sexual abuse and headache as OR change with 0.39, and sexual abuse and abdominal pain with a change in OR of 0.35. In the remaining cases, no change is found adjusting for different psychiatric disorders.

Significant results were found for all tests for victim of violence and musculoskeletal pain (OR 1.97, CI 1.16 to 3.35, p=.012), and for sexual abuse and musculoskeletal pain (OR 2.76, CI 1.64 to 4.64, p<.001). Analysis of sexual abuse and headache is also significant prior to adjusting for depression and anxiety (OR 1.72, CI 1.03 to 2.85, p=.037), and the same holds for household dysfunction and musculoskeletal pain (OR 1.71, CI 1.02 to 2.89, p=.044). In all of the analysis, adding a psychiatric diagnosis makes the results less significant.

Discussion

Summary of the main findings

To the author's knowledge this is the first study to investigate the associations of adversities and chronic pain in children and adolescents in the RYC population in Norway, and whether age, sex and presence of a psychiatric diagnosis has an influence on these associations. In short, the results of the current study suggest that the percentage of individuals experiencing any pain is higher for those who had been victim of an adversity. Further, the greatest differences were found between those who had or had not experienced sexual abuse, and traumatic experiences seemed to explain more of the variance in musculoskeletal pain than headache and abdominal pain. When controlled for, age did not have any meaningful effect on the results, while sex reduced the effect seen of exposure to adversity to presence of pain in some of the analysis. Sex can be considered a possible confounder in the cases where the greater changes were observed, such as sexual abuse and headache, sexual abuse and abdominal pain, and household dysfunction and abdominal pain. Most of the results were not statistically significant. In addition, one case of Simpson's paradox was found for victim of violence and abdominal pain when controlling for sex. Then, when adjusting for psychiatric diagnoses depression had a large effect on the relationship between sexual abuse and all pain variables. In addition, anxiety had a great effect on sexual abuse and musculoskeletal pain.

Frequencies

The prevalence of adversities in this study seems to resemble the prevalence of potentially traumatic events in the Hel-BUP and Ung-HUNT populations in Norway. However, in the mentioned studies, potentially traumatic events cover a wider category of events, some being less serious than the once mapped in the current study. In addition, a systematic review of the frequency of past year violence in different continents estimated the prevalence to be about 50%, although the lowest incidents were in Europe (Hillis et al., 2016). The aforesaid suggests that adversities are quite common in the general population as well as the RYC population. Still, prevalence of health issues is reported to be more common in the out-of-home care population (Greger et al., 2015). A possible explanation may be that the out-of-home care population in addition to exposure to adversities are likely to live in a different home- or school environment with potentially less support from their primary care givers. Among the adolescents in the current sample who expressed chronic pain (50.9%), all had experienced a childhood adversity. The prevalence of chronic pain in the Norwegian CAMHS

is reported to be 70% (Mangerud et al., 2013) whereas the rates in the general youth population has been reported to be between 6-17% (Berg et al., 2011; Larsson & Sund, 2007). Recognizing that the prevalence rate of adversities in the RYC population is 76.9%, one can say the RYC population resemble the CAMHS in terms of impaired physical health.

Exposure to adversities and presence of chronic pain

In line with previous research, the current study found an increase in prevalence of chronic pain after exposure to adversities in all analyzed conditions (Felitti et al., 1998; Norman et al., 2012). Statistically significant results were found for victim of violence and abdominal pain adjusting for sex; victim of violence and musculoskeletal pain in all analyses but behavior disorder; sexual abuse and headache in original analysis and when adjusting for age, ADHD and behavior disorder; sexual abuse and musculoskeletal pain for all analyses; and household dysfunction and musculoskeletal pain in original analysis, adjusting for age, ADHD and behavior disorder. Although not all of the analyses are statistically significant, it supports the current understanding that a stressful experience has a negative impact on an individual's health, including pain (Afari et al., 2014).

As mentioned earlier, the predominant view of pain is today the biopsychosocial model. The subjective pain experience, including site, intensity and quality, is thought to result from interactions of several contributors such as nociceptive, affective, sociocultural, behavioral and cognitive factors (Liossi & Howard, 2016). The model explains the existence of factors but does not indicate the degree of influence of the different elements, nor the direction of influence. The current study has a cross-sectional design with data collected at one point in time, therefore it cannot confirm the direction of cause and effect. It is possible that children with chronic pain are at higher risk of exposure to maltreatment and adversity than healthy children. It remains unclear whether the association between trauma and later chronic pain is a direct result of the trauma or is driven by affective, cognitive, and behavioral responses to the traumatic event (Meints & Edwards, 2018). Still, the biopsychosocial model can help guide our understanding of the relationship between adversities and pain.

To further understand the link between adversities and pain, one can look at the role of toxic stress when a child experiences strong, frequent and/or prolonged adversity without sufficient adult support. Based on the current and earlier research, these are circumstances that many RYC adolescents are likely to have experienced. Prolonged stress can over activate amygdala and increase cortisol levels. Increased level of cortisol can further result in impaired memory and mood control and is typically seen in children with psychosomatic pain. Stress

has also been seen to increase muscular tension and pain sensitivity, also usually seen in children with recurrent pain (Alfven, Grillner, & Andersson, 2019). Further, a review study found childhood adversities to be associated with long term alterations in structure and function of certain brain regions, and changes in stress reactivity. Specifically, they found evidence supporting key neurobiological substrates such as the hypothalamic-pituitary-adrenal (HPA) axis to influence the relationship of early life psychological stress and chronic pain (N. N. Burke, Finn, McGuire, & Roche, 2017). These studies help explain a likely connection between the adverse experiences of the adolescents and their pain experiences. Adding this, chronic pain itself seems to involve long term changes in neural pain networks as well. A shift from brain regions processing nociceptive stimuli to regions involved in emotional and motivational states is observed; areas associated with functions related to emotional and cognitive problems (Liossi & Howard, 2016). Such may help understand the complex relationship of physical and psychological health, in addition to the social environment, and further supports the observed associations between adverse experiences and physical pain in the current study.

Children in foster care are in poor mental and physical health relative to children in the general population. Though, one study found nearly all differences to be explained by adjusting for the current home environment (Turney & Wildeman, 2017). The social environment in form of parents can exert a great influence on pain-related outcomes. Poorly functioning parents and families are typical for adolescents in the RYC. It can complicate dealing with stressors and limit family members' ability to express emotions. Efforts to control the children's pain and increased attention to pain symptoms seem to be a typical result of parental responses such as catastrophizing or exaggerated negative pain evaluations, further linked to worse functional outcomes for the child (Liossi & Howard, 2016). Following, anxiety and depression have been widely documented among mothers of children with chronic pain, and maternal depression is a risk factor for socioemotional and cognitive development of children. Depressed mothers are typically less attentive and responsive to their children as well as poorer models for negative mood regulation and problem solving (Liossi & Howard, 2016). In coherence to these findings, several of the children and adolescents from the current study were removed from their biological home as a result of parental psychological illness. At the same time, positive social support can buffer negative health consequences from stress (Cohen and Wills, 1985). A review study found that increased perception of social support was associated with less pain and improved overall functioning among persons with pain and physical disability (Jensen et al., 2011). In total,

parents' reactions to their children's pain seem to be an important factor determining the children's pain response (Meints & Edwards, 2018).

The current study shows a trend where the greatest difference in pain prevalence is found between those who had or had not experienced sexual abuse. Similar results were found in a previous study showing that a group of women reporting sexual maltreatment had the poorest health outcomes. In addition, many of these participants had been victims of other childhood adversities as well, and the number of experienced abuse categories were correlated with an increased risk of adverse health outcomes (E. A. Walker et al., 1999). In contrast, a recent study of women found that fibromyalgia and chronic widespread pain was more common for those who had experienced emotional abuse and neglect than victims of sexual abuse (Coppens et al., 2017). Further, a meta-analysis found the strongest association between fibromyalgia syndrome and physical abuse, second strongest with sexual abuse, and the least with emotional abuse (Häuser, Kosseva, Üceyler, Klose, & Sommer, 2011). The evidence supports the existing of a difference between physical abuse, emotional abuse and sexual abuse, although the results are not consistent. Considering studies suggesting that a higher number of adversities is associated with greater health problems such as pain, the rate of adversities may be a better predictor of chronic pain in young adults as opposed to the nature of the adverse events (You, Albu, Lisenbardt, & Meagher, 2019). Still, there is limited research regarding abuse and pain among adolescents in the RYC and additional research is important to better understand and care for this high-risk population.

From a biopsychosocial perspective one aspect to be discussed as a possible influence is the role of shame related to experiencing an adversity and further its strain on the individual. A Norwegian national survey interviewing teenagers about sexual abuse and violence described more shame and self-blame related to the sexual assaults (Aakvaag et al., 2016). Considering the mentioned association of social and physical pain above, one can imagine that greater social pain related to an adversity leads to greater physical pain. Another possible explanation for the greater difference for sexual abuse victims is the nature of the adversity; sexual victimization being a trauma that physically involves one's own body and is quite body focused. There is data suggesting that both regions with direct tissue trauma and biological mechanisms not directly related to the tissue injury may contribute to pain after sexual assault. A possible explanation being that mechanisms related to the physiologic stress systems contribute to pain after a sexual assault (Ulirsch et al., 2014). Granot et al. (2011) found that women with a history of sexual abuse report greater somatization, higher pain thresholds and increased pain intensity ratings, a pattern associated with harm avoidance. This

finding neither supports nor disproves the observation of higher pain frequency for sexual assault victims. Another tendency in the current study appears to be that the adversities explain more of the variance in musculoskeletal pain than headache and abdominal pain. Though, there seems to be a lack of research related to this observation and it would be interesting to investigate this more in future research.

The somewhat conflicting findings in this paper and others with regard to the association between specific pain locations and specific adversities might be due to different results reflecting a general sensitivity for chronic pain of different expressions rather than a specific sensitivity for specific adversity. Frequency and coexistence of adversities have been indicated to be of greater importance than type (You et al., 2019).

In sum, the neurobiology of the developing brain seems to be affected by early childhood trauma and adversity, particularly if frequent or continuous and when care from a responsive and nurturing caregiver is lacking. Toxic stress alters brain regions involved in stress response, emotional regulation, cognition and memory. Thus, childhood adversities and toxic stress are correlated with functional outcomes, including pain. This supports and help explain the existence of biological, psychological and social factors influencing the associations between childhood adversities and chronic pain found in the studied RYC population.

Adversities, chronic pain and the role of sex

Looking at the characteristics of the subjects (see Table 1), girls report more pain than boys. This finding is in line with previous research (King et al., 2011). In the current study, sexual abuse, household dysfunction and abdominal pain have especially low prevalence rates for boys and some observations that will be addressed in the next sections may reflect this.

Controlling for sex in the analyses of adversities and pain leads to changes in the odds ratio in several of the relationships analyzed. The initial effect disappears or is greatly reduced in the relationships between sexual abuse and headache, household dysfunction and headache, sexual abuse and abdominal pain, and household dysfunction and abdominal pain. Sex seems to be a possible confounder in these cases as a large part of the correlation between the adversity variable and the pain variable can be explained by sex. For example, when looking at sexual abuse and headache, sex seems to make a substantial change to the odds ratio. This means that one of the sexes, in this case girls, is more exposed to sexual abuse and more often report chronic headache. Headache, abdominal pain and musculoskeletal pain is more common in girls than boys in the general population as well (King et al., 2011) and the

observed sex differences in this study is not surprising. The same holds for exposure to sexual abuse which is reported to be more common for girls (J. L. Walker, Carey, Mohr, Stein, & Seedat, 2004). Looking at data for boys and girls separate, although not significant, the boys' numbers show an opposite trend than the girls. The girls' pain prevalence increases, and boys' decreases after exposure to the abuse. Although one could expect a greater increase among the girls, it is initially surprising that there is a decrease for the boys. A possible explanation is the low numbers of boys reporting sexual abuse in the current study. Observed in the analyses where musculoskeletal pain is the outcome variable, the OR stays almost the same after controlling for sex, suggesting that sex does not have any meaningful influence on the relationship. A reason might be that the relative frequency is more comparable for musculoskeletal pain than headache and abdominal pain for the sexes.

In the case of victim of violence and abdominal pain, the opposite is observed as OR increases when controlling for sex. In this case, sex is also a confounder, but a suppressor variable. It seems to be a case of the Simpson's paradox which is when the marginal association between the variables have a different direction from the conditional association (Agresti, 2018). Looking at boys and girls separately in this analysis, risk ratio is about the same for boys and girls, while the risk difference is much larger for girls than boys. Girls who had been victim of violence had about 16.1% greater chance of abdominal pain than those who had not, while only a 3% greater chance for boys. At the same time the relative risk (RR) is quite similar (girls RR=1.59, boys RR=1.46). There are small, but similar effects for musculoskeletal pain and victim of violence, for headache and victim of violence, and lastly, for abdominal pain and witnessed violence. This seems to mainly be the trend for those who had been victim of violence, and in this study, it is the adversity category in which the boys are more often victimized. This could reflect the big risk difference that is observed after boys and girls experience violence, though there is no clear explanation for this observation. Perhaps girls are more vulnerable to develop somatic symptoms due to differences related to gender, maybe girls are victims of more serious assaults, or maybe girls are more vulnerable than boys in the specific situation? However, a previous study does not support the hypothesis that girls are victims of more serious assaults (Finkelhor, Turner, Shattuck, & Hamby, 2015). One can also ask if it is a consequence of females reporting higher levels of pain intensity than males, or if it is a result of boys being relatively more exposed to violence compared to all the other adversities being studied. More research is needed to better understand this observation.

In the cases where sex has an effect one cannot rule out the possibility that sex differences include other third variables relevant in the development of chronic pain or exposure to adversities. The biopsychosocial model suggests several mechanisms that contribute to the sex difference observed in pain. This includes sex hormones, endogenous opioid function, genetic factors, pain perception and sex roles. Some suggest the sex difference in chronic pain follow changes in sex hormones; in particular, the influence of estrogen on the release of peripheral cytokines, which in turn increases the cortisol levels (Wiesenfeld-Hallin, 2005). Cortisol being a stress hormone associated with psychosomatic pain (Alfven et al., 2019). Next, pain perception, including coping, catastrophizing and affective distress such as depression and anxiety may help explain sex differences. Depression and anxiety will be discussed in depth later. Females seem to use catastrophizing, behavioral activities, positive self-statements, social and emotional support, and problem-focused coping to a greater extent than males (Meints & Edwards, 2018). This may be seen in the context of gender roles. Males typically undertaking a masculine gender norm of increased pain tolerance while females adopt an accepting norm (Myers, Riley III, & Robinson, 2003).

Research has demonstrated that age and sex can influence chronic pain, age being a more controversial factor. The present study did not support an association between age and chronic pain. In contrast, King et al. (2011) review study found abdominal pain to be associated with lower age, while headache and musculoskeletal pain was associated with higher age. Adding to this, similar pain prevalence have been demonstrated across prepubescent boys and girls with emerging differences in after puberty (Greenspan et al., 2007). In particular, adolescent girls around 12-14, reported a considerable increase in chronic pain (King et al., 2011). Adolescents experience bodily changes, changes in cognition, as well as hormonal changes. This developmental stage may be a sensitive period where the individual's vulnerability to developing chronic pain increases (Bosch et al., 2012). Considering these findings, one could presume age to influence the outcome, however the current study did not support this. Lastly, different ages may be burdened with different traumas and age of removal may affect the timing of the most recent adversities, further influencing the outcomes. The field of research seems to lack explorations of these questions which may be needed to better understand the role of age.

Adversities, chronic pain and psychiatric diagnoses

Adolescents with chronic illness self-reported significantly greater internalizing problems than those without a chronic illness (Woods et al., 2013). Further, a systematic

review also indicated that chronic pain patients self-reported greater negative effect (A. L. Burke, Mathias, & Denson, 2015). Earlier research show comorbidity between adversities and depression (Kendler, Karkowski, & Prescott, 1999; Norman et al., 2012) and psychological symptoms are often understood as a consequence of chronic pain. One study described a link between pain and depression, where progressive pain outcomes are associated with increased symptoms of depression (Bair, Robinson, Katon, & Kroenke, 2003). However, some studies suggest that psychological dysfunction may be a risk factor for the future development of chronic pain as well (Meints & Edwards, 2018). A longitudinal study indicated that depression and anxiety predicted pain and pain-related disability (Lerman, Rudich, Brill, Shalev, & Shahar, 2015).

In the present study, depression had a large effect on the odds ratio looking at the relationship between sexual abuse and pain variables. A common theory is that depression and pain share some anatomical pathway of the nervous system. Norepinephrine, serotonin and dopamine are considered key neurotransmitters in the pathophysiology of both depression and pain. Further, brain regions such as the insular cortex, prefrontal cortex, anterior cingulate, thalamus, hippocampus, and amygdala have been shown to be involved in both mood management and sensory pathways of pain (Sheng, Liu, Wang, Cui, & Zhang, 2017). Negative emotions are linked to increased activation in the amygdala, anterior cingulate cortex and the anterior insula, which increases the intensity and frequency of pain (Bushnell, Čeko, & Low, 2013).

There is also some change to victim of family violence and headache, victim of family violence and abdominal pain, household dysfunction and headache, and household dysfunction and abdominal pain, adjusting for depression. This suggest there is a stronger relationship between depression and victim of family violence and household dysfunction, than the other adversities. From a biopsychosocial perspective one can wonder if this can be explained by the fact that these adversities are related to the home environment to a greater degree than the adversities not specifically connected to the family. In addition, these results suggest that depression has a stronger association with headache and abdominal pain compared to musculoskeletal pain. In Mangerud et al. (2013) study, musculoskeletal pain was the most frequent type of chronic pain among the adolescents with a psychiatric disorder, including those with mood- and anxiety disorders. Mangerud reflects whether the variations are a result of the various definitions of chronic pain. In difference, in the present study headache was the most prevalent type of pain across all adolescents, including those with

psychiatric disorders. Headache has been found to be the strongest predictor of psychiatric morbidity in other studies as well (Knook et al., 2011).

In addition, in the present study, anxiety has a great effect on sexual abuse and musculoskeletal pain, as well as some effect on sexual abuse and headache, and sexual abuse and abdominal pain. This demonstrates that anxiety mostly affects the relationship of sexual abuse and pain. The sensation of pain also involves a cognitive component; the physiological sensations can be interpreted in a catastrophic matter, which can increase anxiety and pain intensity. Increased beliefs in capacity to cope with stressor, in this case the bodily sensations of pain, has been associated with lower levels of anxiety symptoms (Riskind & Calvete, 2020), likely in relation to whether the individual perceive a threat.

A meta-analysis by Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg and van IJzendoorn, cited by Sharpe et al. (2012) states there is an attentional bias in which there is a selective attention toward threat-related stimuli in anxiety disorders. This may include pain, as the pain sensation can be an important sensation to survival (Alfven et al., 2019). This attentional bias toward threats has been observed in individuals with chronic pain, though a meta-analysis found differing evidence (Crombez, Van Ryckeghem, Eccleston, & Van Damme, 2013). Attentional bias does not necessarily imply that these biases cause negative responses to pain, but may be considered to be a vulnerability marker for such negative responding (Keogh, Ellery, Hunt, & Hannent, 2001) or intensifying the perceived pain as the attention is focused towards the pain experience.

Both mood and anxiety disorders have been found to partially mediate the relationship between adverse childhood experiences and pain. It has been suggested that adversities, mood and anxiety disorders independently and directly contribute to pain-related conditions, and that adversities increase the risk of mood and anxiety disorders, which in turn contribute to the development of pain-related conditions (Sachs-Ericsson, Kendall-Tackett, & Hernandez, 2007; Sachs-Ericsson, Sheffler, Stanley, Piazza, & Preacher, 2017). In the current study, depression and anxiety would be considered mediators in the cases where they appear to have a pronounced effect. In most of the other cases, no change is found adjusting for different psychiatric diagnosis. These results are in line with the general findings in the literature indicating that depressive disorders and anxiety disorders in particular are associated with chronic pain. It has been suggested that the association between childhood maltreatment and psychiatric disorders can be explained by underlying developmental mechanisms and/or other mediating factors (Hankin, 2005; McLaughlin & Lambert, 2017). Pain should therefore be

understood in terms of a biopsychosocial model, as one considers the interactions between psychological, social and biological factors.

Strengths and limitations

This study has several strengths. This includes a relatively large sample, providing representative data for the national RYC population. The diagnostic interview (CAPA) was used for psychiatric diagnosis and childhood maltreatment. Trained research assistants conducted the interviews, and diagnostic conclusions (in accordance with DSM-IV) were based on computer algorithms using information from the diagnostic interview. Inter-rater reliability was calculated and considered good, and based on the design for data collection the diagnosis can be viewed as very valid. In contrast to much of the earlier research on adversity and health outcomes, this study does not rely on retrospective memory which has shown to be vulnerable for inaccurate reports. A longitudinal design with repeated measurements would have been ideal, and this is a step in the right direction.

However, the current study has several limitations that need to be acknowledged. The cross-sectional design of the study does not allow for causal interferences. The exact timing of the adversities or onset of chronic pain was not identified. Therefore, it is possible that pain had been experienced earlier than the time of data collection or that pain onset was prior to exposure to the adversity. Further, the timing of victimization may be of importance to the effect on chronic pain. Timing of stress exposure, inter alia whether the child was exposed to adversities in early childhood or more recently, may be of importance. Some findings indicate that adolescents (after age 11) are particularly sensitive to stressful experiences leading to long-term programming of HPA-axis regulation and sensitization to stressors (Bosch et al., 2012). Another review study suggests that both the amygdala and hippocampus are highly vulnerable to the effects of early adversities, whereas the effects on the amygdala are more prominent in early life and the effects on the hippocampus later in life (Tottenham & Sheridan, 2010). Both structures are meaningful in the discussion of adversities and pain as mentioned earlier.

Another limitation is that modifications were made to a few variables before the statistical analysis. Most of the variables with multiple values were computed into dichotomous variables, being a potential source to lost information. This holds for victim of physical violence and witnessing violence, where the nature of the relationship to the offender was not evaluated. Neither was degree of harm for victim of violence and sexual abuse. These are nuances that could potentially be of importance. Further, when looking at the pain

conditions, it was rated as either "pain" or "no pain" in the data collection. This is a very simplified way to assess the variable as there are several degrees of pain, both in frequency and intensity (Von Korff, Dworkin, & Le Resche, 1990). There are also other pain sites that could have been examined, but this study focused on the three most common ones (Perquin et al., 2000).

Adding to this, when categorizing the variables as present or not present the frequency of exposure is not taken into account. Neither is the effect of poly-victimization; exposure to more than one type of childhood adversity (Ford, Grasso, Hawke, & Chapman, 2013; Greger, 2017). Poly-victimization has been shown to be common amongst victimized children and youth, with an overlap between different types of adversities (Finkelhor et al., 2007). The results from a meta-analysis suggest being exposed to poly-victimization further increase the risk for many health conditions (Hughes et al., 2017) and is associated with more complex psychopathology later in life (Putnam, Harris, & Putnam, 2013). The poly-victims have been shown to be more symptomatic than children with only one repeated episode of the same kind of victimization (Finkelhor et al., 2007).

Next, there is no concrete definition of what childhood adversities includes. Therefore, the mapping of adversities in this study can be argued to not be fully comprehensive. In other research, it is argued that interpersonal loss, physical illness and family economic adversity could be relevant adversities to investigate as well (Kessler et al., 2010; Oh et al., 2018). Also, the variable household dysfunction could have been extended to include problems with alcohol and substance abuse, mental illness and criminality in the household beyond it being the reason for the first removal (Greger et al., 2015). More information about neglect and emotional abuse could have been useful as the participants, considered to be characterized by high levels victimizations, are likely to have experienced some form of neglect. These factors may have an effect on the youth that is not examined in this study.

Following, all youths in the current study have been removed from their biological family. This can itself be experienced as a traumatic event (Bruskas, 2008; Schneider & Phares, 2005). There might be a distinction between the children or adolescents whom were removed voluntarily and those removed by force, where one would expect those removed by force to suffer more. At the same time, one can presume there are good reasons behind the placements in the child welfare system, and therefore assume that also involuntary placements might lead to positive outcomes in a long perspective. However, involuntary placements indicate more serious conditions (Bufdir, 2016).

Finally, the present study examined a sample of adolescents in foster care which could also limit the generalizability of the results. The results may not apply for youths exposed to adversities not placed in foster care or youths with lower levels of exposure. Adolescents in residential care include a population where nearly all lived with unsafe conditions and therefore removed from the home.

Clinical implications

This study supports the earlier findings that children and adolescents in the RYC are at higher risk for childhood adversities, as well as chronic pain. It further highlights the importance of asking the youth about possible health problems, screening those with repeated complaints about headache, abdominal pain or musculoskeletal pain for childhood adversities or other psychological stressors. Future research might apply longitudinal research designs to investigate whether there exists a causal relationship between adversities and pain.

Identifying stress as a cause of pain has great implications for clinical practice in understanding certain diagnostic signs and in developing relevant treatment. More research is needed to examine treatment and intervention in this high-risk group to improve the support and help that they are in need of. The high prevalence of psychiatric diagnosis and chronic pain suggest that this population do not receive necessary help. One should examine the effect of early intervention for families with several stressors and assess whether or to what degree negative impact of adversities on the adolescents can be reduced in a long-term perspective, as well as focusing on safe and stable environments for the adolescents who are already removed from their biological home.

Conclusion

In this study, there was a relatively high prevalence of childhood adversities and chronic pain in the residential youth care population. The results indicate a relationship between the two, where being victim of an adversity increases the chances of experiencing pain. The greatest relative increase was found for those who had experienced sexual abuse. Further, sex reduced the effect seen of exposure to adversity to presence of pain for sexual abuse and headache, sexual abuse and abdominal pain, and household dysfunction and abdominal pain. In addition, sex strengthened the observed relationship between victim of violence and abdominal pain. Depression had a large effect on the relationship between sexual abuse and all pain variables, and anxiety had a great effect on sexual abuse and musculoskeletal pain. The biopsychosocial model suggests a range of biological and psychosocial variables that act and interact as risk or protective factors, influencing the pain condition, the treatment outcome and the subjective pain experience. Pain has numerous psychosocial and functional consequences in both emotional-, cognitive- and behavioral areas. As pain persists over time these areas will further affect the pain experience. This study supports exitance of and helps to further understand the biopsychosocial processes involved in the associations between childhood adversities, chronic pain, psychiatric disorders and sex. The findings in this study underline the importance of detecting exposure to childhood adversities and chronic pain in adolescents in the RYC, provide targeted treatment, as well as prevent further exposure to adversities. This to reduce poor long-term outcomes for these high-risk youths.

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Appendix

Table A1. Cross tables for all pain and adversity variables

Victim of violence	Headache No	Yes	Total
No	167 (67.9%)	79 (32.1%)	246 (100%)
Yes	52 (64.2%)	29 (35.8%)	81 (100%)
Total	219 (67%)	108 (33%)	327 (100%)
p			.541

Victim of family violence	Headache No	Yes	Total
No	139 (70.6%)	58 (29.4%)	197 (100%)
Yes	80 (62%)	49 (38%)	129 (100%)
Total	219 (67.2%)	107 (32.8%)	326 (100%)
p			.108

Sexual abuse	Headache No	Yes	Total
No	165 (70.7%)	68 (29.3%)	232 (100%)
Yes	52 (58.4%)	37 (41.6%)	89 (100%)
Total	216 (67.3%)	105 (32.7%)	321 (100%)
p			**.036**

Witnessed violence	Headache No	Yes	Total
No	159 (68.2%)	74 (31.8%)	233 (100%)
Yes	57 (62.6%)	34 (37.4%)	91 (100%)
Total	216 (66.7%)	108 (33.3%)	324 (100%)
p			.336

Household dysfunction	Headache No	Yes	Total
No	169 (69%)	76 (31%)	245 (100%)
Yes	55 (63.2%)	32 (36.8%)	87 (100%)
Total	230 (71.2%)	93 (28.8%)	323 (100%)
p			.324

Victim of violence	Abdominal pain No	Yes	Total
No	197 (80.4%)	48 (19.6%)	245 (100%)
Yes	60 (74.1%)	21 (25.9%)	81 (100%)
Total	257 (78.8%)	69 (21.2%)	326 (100%)
p			.226

Victim of family violence	Abdominal pain No	Yes	Total
No	157 (80.1%)	39 (19.9%)	196 (100%)
Yes	98 (76%)	31 (24%)	129 (100%)
Total	255 (78.5%)	70 (21.5%)	325 (100%)
p			.375

Sexual abuse	Abdominal pain No	Yes	Total
No	187 (81%)	44 (19%)	231 (100%)
Yes	64 (71.9%)	25 (28.1%)	89 (100%)
Total	251 (78.4%)	69 (21.6%)	320 (100%)
p			.078

Abdominal pain

Witnessed violence	No	Yes	Total
No	185 (79.4%)	48 (20.6%)	233 (100%)
Yes	68 (75.6%)	22 (24.4%)	90 (100%)
Total	253 (78.3%)	70 (21.7%)	323 (100%)
p			.452

Abdominal pain

Household dysfunction	No	Yes	Total
No	169 (69%)	76 (31%)	245 (100%)
Yes	55 (63.2%)	32 (36.8%)	87 (100%)
Total	224 (67.5%)	108 (32.5%)	332 (100%)
p			.074

Musculoskeletal pain

Victim of violence	No	Yes	Total
No	184 (75.1%)	61 (24.9%)	245 (100%)
Yes	49 (60.5%)	32 (39.5%)	81 (100%)
Total	233 (71.5%)	93 (28.5%)	326 (100%)
p			**.012**

Musculoskeletal pain

Victim of family violence	No	Yes	Total
No	145 (73.6%)	52 (26.4%)	197 (100%)
Yes	87 (68%)	41 (32%)	128 (100%)
Total	232 (71.4%)	93 (28.6%)	325 (100%)
p			.181

Musculoskeletal pain

Sexual abuse	No	Yes	Total
No	180 (77.6%)	52 (22.4%)	232 (100%)
Yes	49 (55.7%)	39 (44.3%)	88 (100%)
Total	229 (71.6%)	91 (28.4%)	320 (100%)
p			**< .001**

Musculoskeletal pain

Witnessed violence	No	Yes	Total
No	172 (73.8%)	61 (26.2%)	233 (100%)
Yes	58 (64.4%)	32 (35.6%)	90 (100%)
Total	230 (71.2%)	93 (28.8%)	323 (100%)
p			.095

Musculoskeletal pain

Household dysfunction	No	Yes	Total
No	199 (81.2%)	46 (18.8%)	245 (100%)
Yes	62 (72.1%)	24 (27.9%)	86 (100%)
Total	261 (78.9%)	70 (21.1%)	331 (100%)
p			**.043**

Table A2. Cross tables for all pain and adversity variables for separate sex

	Headache					
Victim of violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	91 (59.1%)	63 (40.9%)	154 (100%)	76 (82.6%)	16 (17.4%)	92 (100%)
Yes	22 (56.4%)	17 (43.6%)	39 (100%)	30 (71.4%)	12 (28.6%)	42 (100%)
Total	113 (58.5%)	80 (41.5%)	193 (100%)	106 (79.1%)	28 (20.9%)	134 (100%)
p			.761			.140

	Headache					
Victim of family violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	62 (61.4%)	39 (38.6%)	101 (100%)	77 (80.2%)	19 (19.8%)	96 (100%)
Yes	51 (56.0%)	40 (44.0%)	91 (100%)	29 (76.3%)	9 (23.7%)	38 (100%)
Total	113 (58.9%)	79 (41.1%)	192 (100%)	106 (79.1%)	28 (20.9%)	134 (100%)
p			.453			.617

	Headache					
Sexual abuse	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	68 (61.8%)	42 (38.2%)	110 (100%)	96 (78.7%)	26 (21.3%)	122 (100%)
Yes	44 (55.0%)	36 (45.0%)	80 (100%)	8 (88.9%)	1 (11.1%)	9 (100%)
Total	112 (58.9%)	78 (41.1%)	190 (100%)	104 (79.4%)	27 (20.6%)	131 (100%)
p			.346			.465

	Headache					
Witnessed violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	88 (62.0%)	54 (38.0%)	142 (100%)	71 (78.0%)	20 (22.0%)	91 (100%)
Yes	24 (48.0%)	26 (52.0%)	50 (100%)	33 (80.5%)	8 (19.5%)	41 (100%)
Total	112 (58.3%)	80 (41.7%)	192 (100%)	104 (78.8%)	28 (21.2%)	132 (100%)
p			.085			.748

	Headache					
Household dysfunction	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	77 (59.7%)	52 (40.3%)	129 (100%)	92 (79.3%)	24 (20.7%)	116 (100%)
Yes	39 (58.2%)	28 (41.8%)	196 (100%)	16 (80.0%)	4 (20.0%)	20 (100%)
Total	116 (59.2%)	80 (40.8%)	196 (100%)	108 (79.4%)	28 (20.6%)	136 (100%)
p			.841			.944

	Abdominal pain					
Victim of violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	111 (72.5%)	42 (27.5%)	153 (100%)	86 (93.5%)	6 (6.5%)	92 (100%)
Yes	22 (56.4%)	17 (43.6%)	39 (100%)	38 (90.5%)	4 (9.5%)	42 (100%)
Total	133 (69.3%)	59 (30.7%)	192 (100%)	124 (92.5%)	10 (7.5%)	134 (100%)
p			.051			.540

	Abdominal pain					
Victim of family violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	70 (70%)	30 (30%)	100 (100%)	87 (90.6%)	9 (9.4%)	96 (100%)
Yes	62 (68.1%)	29 (31.9%)	91 (100%)	36 (94.7%)	2 (5.3%)	38 (100%)
Total	132 (69.1%)	59 (30.9%)	191 (100%)	123 (91.8%)	11 (8.2%)	134 (100%)
p			.780			.434

	Abdominal pain					
Sexual abuse	Girls			Boys		

	No	Yes	Total	No	Yes	Total
No	74 (67.9%)	35 (32.1%)	109 (100%)	113 (92.6%)	9 (7.4%)	122 (100%)
Yes	57 (71.3%)	23 (28.7%)	80 (100%)	7 (77.8%)	2 (22.2%)	9 (100%)
Total	131 (69.3%)	58 (30.7%)	189 (100%)	120 (91.6%)	11 (8.4%)	131 (100%)
p			.621			.121

Abdominal pain

Witnessed violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	102 (71.8%)	40 (28.2%)	142 (100%)	83 (91.2%)	8 (8.8%)	91 (100%)
Yes	30 (61.2%)	19 (38.8%)	49 (100%)	38 (92.7%)	3 (7.3%)	41 (100%)
Total	132 (69.1%)	59 (30.9%)	191 (100%)	121 (91.7%)	11 (8.3%)	132 (100%)
p			.166			.777

Abdominal pain

Household dysfunction	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	93 (72.1%)	36 (27.9%)	129 (100%)	106 (91.4%)	10 (8.6%)	116 (100%)
Yes	43 (65.2%)	23 (34.8%)	66 (100%)	19 (95.0%)	1 (5%)	20 (100%)
Total	136 (69.7%)	59 (30.3%)	195 (100%)	125 (91.9%)	11 (8.1%)	136 (100%)
p			.318			.583

Musculoskeletal pain

Victim of violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	107 (69.9%)	46 (30.1%)	153 (100%)	77 (83.7%)	15 (16.3%)	92 (100%)
Yes	21 (53.8%)	18 (46.2%)	39 (100%)	28 (66.7%)	14 (33.3%)	42 (100%)
Total	128 (66.7%)	64 (33.3%)	192 (100%)	105 (78.4%)	29 (21.6%)	134 (100%)
p			.057			**.026**

Musculoskeletal pain

Victim of family violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	70 (69.3%)	31 (30.7%)	101 (100%)	75 (78.1%)	21 (21.9%)	96 (100%)
Yes	58 (64.4%)	32 (35.6%)	90 (100%)	29 (76.3%)	9 (23.7%)	38 (100%)
Total	128 (67%)	63 (33%)	191 (100%)	104 (77.6%)	30 (22.4%)	134 (100%)
p			.476			.821

Musculoskeletal pain

Sexual abuse	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	84 (76.4%)	26 (23.6%)	110 (100%)	96 (78.7%)	26 (21.3%)	122 (100%)
Yes	43 (54.4%)	36 (46.6%)	79 (100%)	6 (66.7%)	3 (33.3%)	9 (100%)
Total	127 (67.2%)	62 (32.8%)	189 (100%)	102 (77.9%)	29 (22.9%)	131 (100%)
p			**.002**			.402

Musculoskeletal pain

Witnessed violence	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	97 (68.3%)	45 (31.7%)	142 (100%)	75 (82.4%)	16 (17.6%)	91 (100%)
Yes	30 (61.2%)	19 (38.8%)	49 (100%)	28 (68.3%)	13 (31.7%)	41 (100%)
Total	127 (66.5%)	64 (33.5%)	191 (100%)	103 (78.0%)	29 (22.0%)	132 (100%)
p			.365			.070

Musculoskeletal pain

Household dysfunction	Girls			Boys		
	No	Yes	Total	No	Yes	Total
No	93 (72.1%)	36 (27.9%)	129 (100%)	89 (76.7%)	27 (23.3%)	116 (100%)
Yes	37 (56.1%)	29 (43.9%)	66 (100%)	17 (85.0%)	3 (15.0%)	20 (100%)
Total	130 (66.7%)	65 (33.3%)	195 (100%)	106 (77.9%)	30 (22.1%)	136 (100%)
p			**.025**			.410

Appendix B. Copy of REK-approval

REK
REGIONALE KOMITEER FOR MEDISINSK OG HELSEFAGLIG FORSKNINGSETIKK

Region:	Saksbehandler:	Telefon:		Vår dato:	Vår referanse:
REK midt	Ramunas Kazakauskas	73597510		14.06.2018	2010/1965/REK midt
				Deres dato:	**Deres referanse:**
				12.06.2018	

Vår referanse må oppgis ved alle henvendelser

Nanna Sønnichsen Kayed
NTNU

2010/1965 Psykisk helse hos barn i barnevernsinstitusjoner

Forskningsansvarlig: NTNU, Norges teknisk-naturvitenskapelige universitet
Prosjektleder: Nanna Sønnichsen Kayed

Vi viser til søknad om prosjektendring datert 12.06.2018 for ovennevnte forskningsprosjekt. Søknaden ble behandlet av sekretariat for REK midt på fullmakt, med hjemmel i helseforskningsloven § 11 og forskrift om behandling av etikk og redelighet i forskning § 10.

Prosjektleder søker om å endre sluttdatoen for prosjektet til 31.12.2018.

Prosjektleder søker videre om å registrere nye prosjektmedarbeidere (Trude Reinfjell, Solveig Løken) som ønsker å få tilgang til avidentifiserte datavariabler innhentet til hovedprosjektet for å gjennomføre nye analyser. De skal undersøke mulige sammenhenger mellom variablene traumatiske hendelser, psykisk helse og fysisk smerte.

Vurdering
REK midt har vurdert søknad om prosjektendring, og har ingen forskningsetiske innvendinger mot endringen av prosjektet. Dataene vil innhentes uten tilknytning til personidentifiserende data. Hensynet til deltakernes velferd og integritet er fremdeles godt ivaretatt.

Vi minner om at prosjektet må gjennomføres i henhold til tidligere vedtak i saken. Frist for innsending av sluttmelding er seks måneder etter ny sluttdato.

Vedtak
Regional komité for medisinsk og helsefaglig forskningsetikk Midt-Norge godkjenner søknad om prosjektendring.

Klageadgang
Du kan klage på komiteens vedtak, jf. helseforskningsloven § 10 og forvaltningsloven § 28 flg. Klagen sendes til REK midt. Klagefristen er tre uker fra du mottar dette brevet. Dersom vedtaket opprettholdes av REK midt, sendes klagen videre til Den nasjonale forskningsetiske komité for medisin og helsefag for endelig vurdering.

Med vennlig hilsen

Hilde Eikemo
Sekretariatsleder, PhD
REK midt

Ramunas Kazakauskas
rådgiver

Kopi til: *rek-rkbu@medisin.ntnu.no; rek-midt@mh.ntnu.no*

REK
REGIONALE KOMITEER FOR MEDISINSK OG HELSEFAGLIG FORSKNINGSETIKK

Region:	Saksbehandler:	Telefon:	Vår dato:	Vår referanse:
REK midt	Ramunas Kazakauskas		10.10.2019	14487
			Deres referanse:	

Regional komité for medisinsk og helsefaglig forskningsetikk Midt-Norge godkjenner
søknad om prosjektendring.
Nanna Sønnichsen Kayed

Klageadgang
Du kan klage på komiteens vedtak, jf. forvaltningsloven § 28 flg. Klagen sendes til REK
midt. Klagefristen er tre uker fra du mottar dette brevet. Dersom vedtaket opprettholdes av
REK midt, sendes klagen videre til Den nasjonale forskningsetiske komité for medisin og
helsefag (NEM) for endelig vurdering.

14487 Psykisk helse hos barn i barnevernsinstitusjoner

Forskningsansvarlig: Norges teknisk-naturvitenskapelige universitet

Søker: Nanna Sønnichsen Kayed

REKs vurdering

Du sendte en søknad om prosjektendring den 16.09.2019. Søknaden ble behandlet av
sekretariat for REK midt på fullmakt, med hjemmel i helseforskningsloven § 11 og
forskrift om behandling av etikk og redelighet i forskning § 10.

Du opplyser om at varigheten for underprosjektet til student Solveig Løken vil ta lenger tid
enn planlagt. Underprosjektet skal nå avsluttes den 31.12.2020.

Vurdering

Vi har vurdert søknad om prosjektendring, og har ingen forskningsetiske innvendinger mot
endringen av prosjektet. Hensynet til deltakernes velferd og integritet er fremdeles godt
ivaretatt. Vi minner om at prosjektet må gjennomføres i henhold til tidligere vedtak i
saken.

Vedtak

Godkjent

Regional komité for medisinsk og helsefaglig forskningsetikk Midt-Norge godkjenner
søknad om prosjektendring.

Klageadgang
Du kan klage på komiteens vedtak, jf. forvaltningsloven § 28 flg. Klagen sendes til REK
midt. Klagefristen er tre uker fra du mottar dette brevet. Dersom vedtaket opprettholdes av
REK midt, sendes klagen videre til Den nasjonale forskningsetiske komité for medisin og
helsefag (NEM) for endelig vurdering.

Alle skriftlige henvendelser om saken må sendes via REK-portalen
Du finner informasjon om REK på våre hjemmesider rekportalen.no

Appendix C. Additional adolescent questionnaire

PSYKISK HELSE HOS BARN OG UNGE I BARNEVERNINSTITUSJONER
TILLEGGSINTERVJU AV UNGDOM

ID-nummer ⇨ ☐ Institusjon Individ

Intervjuers initialer ⇨ ☐ STORE bokstaver!

LeS DETTE FØR DU STARTER!	Skjemaet skal leses maskinelt. Vennligst fyll ut skjemaet slik: • Bruk svart/blå kulepenn. Skriv tydelig, og ikke utenfor feltene. **Kryss av slik:** ☒. • Feilkryssinger kan annulleres ved å fylle _hele_ feltet med farge. Kryss så i rett felt. • Sett bare ett kryss på hvert spørsmål om ikke annet er oppgitt.

A. OMSORGSHISTORIKK

1. Hvor mange år var du da du flyttet hjemmefra første gang (etter bestemmelse fra barnevernet)? ⇨ ☐

2. Hvor flyttet du da? ⇨
   Til andre familiemedlemmer ... ☐₁   Til barnehjem/institusjon... ☐₄
   Til fosterforeldre .... ☐₂   Annet........................... ☐₅

   Annet: ⇩   STORE BOKSTAVER, ett tegn pr. felt.
   ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

3. Hva var årsaken til flyttingen?

   NB: Ett eller flere kryss.
   1. Problemer mellom deg og foreldre/foresatte..................... ☐
   2. Bortfall av forelder/foresatt........ ☐
   3. Rusproblemer hos deg.............. ☐
   4. Atferdsproblemer hos deg.......... ☐
   5. Kriminalitet hos deg .... ☐

   6. Foreldres problemer med rus .... ☐
   7. Foreldres problemer med alkohol................ ☐
   8. Foreldres problemer med psykisk sykdom ... ☐
   9. Foreldres problemer med kriminalitet .... ☐
   10. Vold mellom foreldre..................................... ☐
   11. Vold mellom foreldre og deg.......................... ☐