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Liens entre l'agression sexuelle vécue à l'enfance, les troubles mentaux et les maladies infectieuses : une étude de cohorte appariée

par

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Résumé

L'agression sexuelle à l'enfance (ASE) a été fortement associée à plusieurs problèmes physiques et psychologiques à l'enfance et à l'âge adulte, tels que l'anxiété, le trouble du stress post-traumatique (TSPT) et les maladies infectieuses. Malgré ces associations, aucune étude à ce jour n'a étudié les processus biologiques susceptibles de sous-tendre la relation entre l'ASE et les problèmes de santé physique survenant pendant l'enfance, tels que les maladies infectieuses. La présente étude vise à évaluer le TSPT en tant que médiateur potentiel entre l'ASE et l'apparition de maladies infectieuses à court et moyen terme. De plus, nous postulons que le TSPT joue un rôle spécifique d'indicateur de stress chronique à l'enfance, en comparaison à d'autres troubles mentaux tels que les troubles anxieux et non-anxieux (par exemple, la dépression). Au moyen d'un devis prospectif de cohorte appariée, des bases de données administratives ont été utilisées pour documenter le TSPT, les troubles anxieux et non anxieux et les maladies infectieuses. L'échantillon comporte 882 jeunes ayant un rapport corroboré d'agression sexuelle et 882 témoins appariés. Les régressions binomiales négatives ont révélé que l'ASE est associée à un plus grand nombre de diagnostics de troubles anxieux qui, à leur tour, prédisent un plus grand nombre de maladies infectieuses. Les résultats soulignent l'importance de la prévention et de l'intervention auprès des enfants et adolescents victimes d'agression sexuelle et ayant des symptômes d'un trouble anxieux, afin de limiter les conséquences négatives sur la santé physique.

Mots-clés : Psychologie clinique, agression sexuelle à l'enfance, maladies infectieuses, troubles du stress post-traumatique, troubles anxieux

Abstract

Child sexual abuse (CSA) has been strongly associated with a range of psychological and physical problems in childhood and adulthood, such as anxiety, post-traumatic stress disorder (PTSD), and infectious diseases. Despite the strength of these associations, no studies to date have investigated biological processes that might underlie the relationship between CSA and physical health problems occurring during childhood, such as infectious diseases. The goal of the current study is to evaluate PTSD as a potential mediator between CSA and the occurrence of infectious diseases among children and adolescents. Furthermore, we postulate that PTSD plays a specific role as an indicator of chronic stress during childhood, in comparison to other mental disorders, such as anxious and non-anxious disorders (e.g., depression). Via a prospective matched-cohort design, administrative data were used to document PTSD, anxious and non-anxious disorders, and infectious diseases. The sample size was 882 persons with a substantiated report of sexual abuse and 882 matched controls. Negative binomial regressions revealed that CSA is associated with a greater number of anxious diseases diagnoses that, in turn, predict more infectious diseases diagnoses. These findings highlight the importance of preventing and intervening among sexually abused youth with anxious disorder symptoms to limit negative outcomes on physical health.

Keywords: Clinical psychology, child sexual abuse, infectious diseases, post-traumatic stress disorders, anxious disorders

Définitions d’acronymes

CI : Confidence interval

CSA: Child sexual abuse

GP group = General population group

ICD: International classification of diseases

PTSD: Post-traumatic stress disorder

SA group = Sexually abused group

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Relationship Between Child Sexual Abuse, Psychiatric Disorders and Infectious Diseases: A Matched-Cohort Study

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Introduction

Child sexual abuse (CSA) is a global issue affecting the lives of millions of children across the world (Stoltenborgh et al., 2015). Recent studies have estimated that 20% of girls and 8% of boys are victims of sexual abuse before the age of 18 years (Barth et al., 2013; Pereda et al., 2009). Prevalence of child sexual abuse may be underestimated because many instances of sexual abuse are never reported to the authorities (Afifi et al., 2014; Daigneault, Collin-Vézina, & Hébert, 2012).

Mental health impacts of CSA

Several studies have shown that CSA constitutes a risk factor for a variety of psychological problems in adulthood, including depression, anxiety, personality disorder, and interpersonal problems (Hillberg et al., 2011; Maniglio, 2009). Scientific literature has also demonstrated the presence of psychological consequences of CSA during childhood and adolescence (Chang, Kaczkurkin, McLean, & Foa, 2018; Daigneault, Hébert, Bourgeois, Dargan, & Frappier, 2017). Among the documented psychological consequences are depression, suicidal ideation, anxiety, and post-traumatic stress disorder (PTSD) during childhood, as well as substance abuse, suicidal behavior, risky sexual behaviors (e.g., multiple sexual partners, early sexual initiation), and emotional regulation problems during adolescence (Chang et al., 2018; Daigneault et al., 2017; Fergusson, Horwood, & Lynskey, 1997; Tyler, 2002).

A study conducted with children and adolescents who had a substantiated report of sexual abuse found that those reporting CSA were about five times more likely to seek medical attention or to be hospitalized for a mental health problem, compared to children and adolescents who did not have a substantiated report of sexual abuse (Daigneault et

al., 2017). Moreover, children who have experienced adverse childhood experiences, including CSA, showed more distress and consulted professionals more often for mental health problems than youth from the general population, up to 10 years after the substantiated report of sexual abuse (Daigneault, Cyr, & Tourigny, 2007; Dion et al., 2015). One of the most common consequences of CSA is the diagnosis of a PTSD (e.g., Collin-Vezina, Coleman, Milne, Sell, & Daigneault, 2011; Daigneault, Cyr, & Tourigny, 2003; Hébert, Langevin & Daigneault, 2016; McLeer, Deblinger, Henry, & Orvaschel, 1992). Overall, studies indicated that children and adolescents with CSA were more likely to meet the criteria for PTSD or certain clinical symptoms, compared to children and adolescents who had not experienced CSA.

Physical health impacts of CSA

Adverse childhood experiences, including sexual abuse, increase the risk of developing chronic diseases during adulthood (Felitti et al., 1998). For example, a study of adverse childhood experiences revealed that individuals who were exposed to more than four categories of adverse life events were up to 1.6 times more likely to have diabetes (Felitti et al., 1998). Several other studies have more specifically demonstrated that CSA also had consequences for physical health in adulthood, such as symptoms of musculoskeletal pain and obesity, cardiovascular diseases, diabetes, chronic fatigue, headaches, and cardio-respiratory problems (Fuller-Thomson, Brennenstuhl, & Frank, 2010; Irish, Kobayashi, & Delahanty, 2010; Lanier, Jonson-Ried, Stahlschmidt, Drake, & Constantino, 2010).

Little is known about the consequences of CSA on children and adolescents' physical health. A few studies have shown that CSA causes an increase in the number of

injuries during adolescence (e.g., self-injury and hospitalization), somatic complaints, hospitalizations for asthma, sexually transmitted disease, and cardio-respiratory disease (Fergusson et al., 1997; Lanier et al., 2010; Odgers, Robins, & Rusell, 2010; Rogosch, Dackis, & Cicchetti, 2011). Children and adolescents who have been sexually abused are more likely to be hospitalized for a physical health problem and to see a doctor for these same problems up to 10 years after the sexual abuse reports have been substantiated (Daigneault et al., 2017). They also have more diagnoses of urinary and genital health problems up to 12 years after the substantiated sexual abuse (Vézina-Gagnon, Bergeron, Frappier, & Daigneault, 2018).

Moreover, child maltreatment can lead to a variety of physical health problems, such as infectious diseases (Lanier et al., 2010). To our knowledge, only one longitudinal study investigated the relationship between CSA and the presence of infectious diseases (Dargan, Daigneault, Ovetchkine, Jud, & Frappier, 2017). This study found that children and adolescents with a substantiated sexual abuse report had up to 27% more consultations or hospitalizations for any type of infection compared to youth in the general population, thus indicating an association between CSA and more frequent diagnoses of all types of non-sexually transmitted infections. It remains to be understood how CSA is associated with the development of physical health problems during childhood and adolescence.

Explanatory physiological mechanisms

Some mechanisms have been put forward to explain how abuse and adversity experienced during childhood, including sexual abuse, can lead to physical disorders during adulthood. Miller, Chen, and Parker (2011) propose a theoretical model that

asserts that child abuse and adversity are chronic stressors for children, because they lead to a toxic relational environment (Arata, Langhinrichsen-Rohling, Bowers, & O'Brien, 2007). Chronic stress causes, in turn, several physiological reactions by changing the phenotype of some immune cells in the body, which are responsible for the inflammatory response during an infection or injury. The modified phenotype would then respond excessively and have reduced sensitivity to the anti-inflammatory effect of cortisol, which would lead to a chronic inflammatory response of the immune system.

Chronic inflammation can be demonstrated using physiological markers, and several studies have shown that these markers are at a higher level in children, adolescents, and adults who have experienced childhood adversity, compared to individuals who have not (Bielas, Jud, Lips, Reichenbach, & Landolt, 2012, Danese, Pariante, Caspi, Taylor, & Poulton, 2007, Miller & Chen, 2010, Moreira et al., 2018). Finally, this state of chronic inflammation could lead to the emergence of chronic diseases during adulthood, such as premature aging, certain types of cancer, and coronary heart disease (Chung et al., 2009; Mantovani, Allavena, Sica, & Balkwill, 2008). Previous studies have identified CSA as a form of childhood adversity (e.g., Felitti et al., 1998); CSA may also have physical health consequences that could be observed in the short to medium term, before chronic adult diseases develop.

PTSD as an indicator of chronic stress

Chronic stress can also manifest itself through PTSD, and the negative effects of PTSD on the immune system have been well documented, particularly with samples of war veterans (e.g., Levine, Levine, & Levine, 2014; Lindqvist et al., 2014; Renna, O'Toole, Spaeth, Lekander, & Mennin, 2018). Overall, a link has been established

between PTSD and physiological markers indicating an excessive inflammatory response of the immune system. In addition, an altered immune system response has also been found in individuals with PTSD who have experienced adversity and child abuse, including sexual abuse (Bauer, Wieck, Lopes, Teixeira & Grassi-Oliveira, 2010; Wilson, Van Der Kolk, Burbridge, Fisler, & Kradin, 1999). PTSD also has negative consequences for the general health of individuals who suffer from it. This includes breathing problems, sleeping problems, migraines, and various gynecological problems (e.g., Calhoun, Wiley, Dennis, & Beckham, 2009; El-Gabalawy, Blaney, Tsai, Sumner, & Pietrzak, 2018; Sheffler, Rushing, Stanley, & Sachs-Ericsson, 2016). PTSD can also lead to chronic health problems, such as the onset of type 2 diabetes (Roberts et al., 2015).

Stress and infectious diseases

Little is known about the effect of childhood stress on the development of infectious diseases during childhood and adolescence. Traumatic events (e.g., physical or sexual abuse) experienced by adolescents appear to lead to higher levels of Epstein-Barr-virus-related antibodies (i.e., viruses causing infectious mononucleosis), compared to adolescents within the general population (McDade et al., 2000). In addition, a study of a large sample of HIV-positive children with cytomegalovirus (a herpes virus linked to several chronic diseases) used family poverty as an indicator of childhood stress (Avitsur, Levy, Goren, & Grinshpahet, 2015). The results indicated a positive relationship between poverty and the presence of antibodies for cytomegalovirus. Together, these studies suggest that stress and childhood adversity affect the probability of having an infectious viral disease.

To our knowledge, only one study linked stress as manifested by PTSD and the presence of infectious diseases (Boscarino, 1997). Using a sample of US war veterans, this study found that those with a diagnosis of PTSD had a higher lifetime prevalence of a variety of conditions, including non-sexually transmitted infectious diseases, up to 20 years after their military service (Boscarino, 1997). This result indicates that chronic stress, which may be indicated by the diagnosis of PTSD, is related to the presence of infectious diseases. However, to our knowledge, no study has yet documented whether the presence of PTSD could explain the link between CSA and the presence of infectious diseases during childhood and adolescence. It is also unclear whether the link would be specifically related to PTSD rather than psychiatric disorders more generally. Other psychopathologies are indeed linked with inflammatory markers, such as anxiety and depression (e.g., Lamers et al., in press; Osborne et al., 2019). Moreover, mental health in general has been linked to physical problems, such as heart disease and stroke (e.g., Gilmour, 2008; Larson, Owens, Ford, & Eaton, 2001).

Goals and hypotheses

This study aims to address some of the limits of previous studies. Although these studies are relevant to the understanding of the impacts of CSA, they are mostly conducted within adult populations and have a cross-sectional design, which makes it difficult to understand the evolution of the impact of CSA and interactions between mental and physical health over time. The main goal of this study is to determine whether the link between CSA and the occurrence of infectious diseases during childhood and adolescence can be explained by the presence of PTSD. We postulate that children and adolescents who are victims of sexual abuse, in comparison to children and adolescents

within the general population, will have more consultations or hospitalizations for PTSD, which will then lead to more immune system dysfunctions manifesting in larger numbers of consultations or hospitalizations for infectious diseases. We also postulate that PTSD will play a specific role in the occurrence of infectious diseases, in comparison to other mental disorders, such as anxious and non-anxious disorders (e.g., depression); in other words, it will explain a greater percentage of the total effect of CSA on the number of infectious disease diagnoses.

Methods

Procedures and participants

This observational study used a matched-cohort design. Observational studies are essential for documenting underpinned links by causal mechanisms, when experimental studies are impossible to perform for ethical and practical reasons (Black, 1996). The ethics committee of the first author's institutional review board, the commission for access to information, and the participating child protection agency issued ethical certificates of conformity and granted authorisation to obtain data from three Canadian administrative databases: (1) one large Canadian city's child protection agency, (2) the provincial public health insurance agency, and (3) the Ministry of Health and Social Services.

Children and adolescents younger than 18 years old who had a substantiated report of sexual abuse between January 1, 2001, and December 31, 2010, were selected and constitute the sexually abused group (SA group; $N = 955$). The inclusion criterion specified that participants' medical data should be accessible. Via the use of their surname, name, complete address, date of birth, and health insurance number,

administrative data from the public health insurance agency were found for 882 of these children and adolescents (92%). Therefore, 73 individuals were excluded from the study and comparisons between those participants and those whose health data were matched (N = 882) as described in a previous publication (Daigneault et al., 2017).

Each of the 882 children and adolescents were then matched to another child or adolescent from the general population using the administrative databases of the public health insurance agency according to the four following criteria: (1) sex, (2) birth year and month, (3) administrative region of residence at the time of the substantiated report of sexual abuse, and (4) eligibility to the province's public prescription drug insurance plan the year of the report. The 882 individuals composing the general population group (GP group) must not have had a substantiated report of sexual abuse between January 1, 2001, and December 31, 2010 at the participating child protection agency. The SA and GP groups were each composed of 661 girls (75%) and 221 boys (25%). The average age of participants when the first sexual abuse report was substantiated was 11.07 years (SD = 4.18; Daigneault et al., 2017). For more details on the methodology, see Daigneault et al. (2017).

Independent variable

In the present study, CSA was defined as any gesture of a sexual nature, with or without contact, committed by an individual without the consent of the person concerned or, in some cases, through emotional manipulation (Ministry of Health and Social Service, 2001). A sexual abuse report must follow a few steps to be substantiated (Ministry of Health and Social Service, 2010). If the report is retained for an evaluation, an assessment must be made by child protection agency social workers, who determine

whether the evidence is enough to conclude that the sexual abuse has occurred. If so, the sexual abuse report is founded and the abuse itself substantiated, whether the safety of the child's development is in danger or not. In the current study, if a child or an adolescent has more than one substantiated report of sexual abuse, the first substantiated report was used. This ensures that each participant is unique and not duplicated.

Dependent variable

All diagnoses of infectious diseases occurring between January 1, 1996, and March 31, 2013, were documented from the same database. The following diagnosis categories from the 10th version (2008) of the International Classification of Diseases (ICD) were included in this study: (1) certain infectious and parasitic diseases and (2) any other diagnosis associated with a disease whose cause is bacterial or viral (e.g., meningitis). Sexually transmitted infectious diseases have been excluded from the current study, as they may be related to at-risk behaviors in addition to physiological alteration of the immune system (Senn, Carey, & Vanable, 2008). The number of medical consultations or hospitalizations for one of the diagnostic categories listed above, occurring after the substantiated report of sexual abuse and after the first occurrence of a mediating variable (if any), was calculated. The number of medical consultations or hospitalizations for one of the diagnostic categories listed above, occurring before the substantiated report or between the substantiated report and the first occurrence of a mediating variable, was also calculated and used as control variables.

Mediating variable

Three mediating variables were created using PTSD, anxious disorders, and non-anxious psychiatric disorders occurring between January 1, 1996, and March 31,

2013; they were documented from the Ministry of Health and Social Service's administrative database. The diagnostic descriptions from the 10th version (2008) of the ICD were included in the PTSD, anxious disorder, and non-anxious psychiatric disorder categories (see Table 1). The number of medical consultations or hospitalizations for each of the three diagnostic categories listed, occurring after the substantiated report of sexual abuse but before the diagnosis of an infection disease, was calculated. The number of medical consultations or hospitalizations for each of the three diagnostic categories listed, occurring before the substantiated report, was also calculated and used as control variables.

Control variables

Material and social deprivation indexes (Hamel, Pampalon, & Gamache, 2009; Pampalon & Raymond, 2000) were used as control variables because of their potential link with sexual abuse (Hussey, Chang, & Kotch, 2006) and health problems (Pampalon et al., 2012). Additional control variables include age and sex of participants, as well as the time elapsed between the reported sexual abuse and the end of the study (time of exposure).

Analyses

Using SPSS 24.0, descriptive statistics (mean and standard deviation) were calculated to examine the distribution of the mediating and outcome variables (count data) within the sample, and Pearson correlations were performed to assess the associations between study variables. A preliminary analysis using intraclass correlation

was first carried out to determine if the matched dyads were independent and indistinguishable with regards to the outcome variable, that is, the degree of similarity between two members of the dyad on that variable (Kenny, Kashy, Cook, & Simpson, 2006). If there is independence, then each participant can be considered as a unit in the analysis. Conversely, if the analysis reveals nonindependence of the dyads, they need to be explicitly considered in the analysis. Results of intraclass correlations reveal that the two members of a dyad are independent with regards to the dependent variable (intraclass correlation = -0.020, 95% confidence interval [CI = -0.086, 0.046]), allowing the main analysis to focus on the individual person as a unit, rather than on the dyad. Consequently, the hypothesized model was tested using path analysis to assess whether the three mediating variables (i.e., PTSD and anxious and non-anxious disorder diagnoses) mediated the effects of CSA on infectious disease diagnoses. Path analysis is a statistical method that allows the simultaneous testing of both direct and indirect effects among different variables (Kline, 2011). It also estimates covariation among study variables by considering all paths simultaneously.

Examinations of direct and indirect effects were conducted using negative binomial regressions on MPlus version 8.1 with a 5% significance level. This program accounts for missing data using robust standard errors for count data. The causal order of the variables was determined based on chronology (i.e., dates of consultations and hospitalizations for the various diagnoses are available, which makes it possible to infer a chronological order). Direct and indirect effects were considered statistically significant when zero was not within the CI. The analyses were performed with consideration of the control factors listed above (i.e., age, sex, time of exposure, material and social

deprivation indexes, infectious diseases and mediating variables occurring before the substantiated report of sexual abuse, and infectious diseases occurring between the substantiated report and the first occurrence of a mediating variable). Next, we computed the ratio of the indirect effect to the total effect (Preacher & Kelley, 2011). A higher value for the ratio indicated a greater contribution of the mediators in the relationship between the independent variable and the dependant variable.

Results

Preliminary analyses

Table 2 shows results of the descriptive statistics of the number of consultations and hospitalizations for PTSD, anxious disorder, non-anxious disorder, and infectious disease diagnoses. Unadjusted means were systematically higher in the SA group than in the GP group. Among the three mediators, non-anxious disorders and PTSD diagnoses are respectively those with the highest and lowest number of consultations or hospitalizations after the CSA report. Table 2 also shows results of the Pearson correlation matrix for PTSD, anxious disorders, non-anxious disorders, and infectious diseases. Bivariate correlations indicate that all variables are significantly and positively related with each other: mediators had medium-size relationships amongst them, while small relationships were found between all mediators and infectious diseases diagnoses. To illustrate the distribution of psychiatric disorders in the sample, Table 3 shows the proportion of participants with at least one psychiatric diagnosis after the substantiated report of sexual abuse and before the occurrence of an infectious disease. In the current sample, less than half of the children and adolescents in the SA group and more than half in the GP group had no psychiatric diagnosis. Table 3 also indicates that participants in

the SA group had systematically more psychiatric diagnosis than those in the GP group. Among both groups, the most common diagnostic category was non-anxious psychiatric disorders, which also had the highest comorbidity rate. Finally, few children and adolescents had at least one diagnosis of both PTSD and anxious disorder.

Main mediation analyses

Figure 1 shows results of the final statistical model of negative binomial regressions of CSA on the number of consultations and hospitalizations for infectious diseases via the three mediating variables (i.e., number of consultations and hospitalizations for PTSD and anxious and non-anxious disorders) for all participants, when age, sex, time of exposure, material and social deprivation indexes, infectious diseases and mediating variables occurring before the substantiated report of sexual abuse, and infectious diseases occurring between the substantiated report and the first occurrence of a mediating variable are controlled. Path analysis was performed to examine the direct associations between CSA and PTSD, anxious disorders, and non-anxious disorders, with results indicating a significant and positive relationship with all three mediating variables. The results also indicate that anxious disorder diagnoses were significantly and positively related to the subsequent number of infectious disease diagnosis consultations and hospitalizations; the other two mediators were unrelated with the dependant variable.

The mediational model shows, as illustrated in Figure 1, that children of the SA group had more consultations and hospitalizations for infectious diseases in the years following the substantiated report than children of the GP group, and this link is made through a greater prevalence of post-report consultations and hospitalizations for anxious

disorders among sexually abused youth. Indeed, because the CI does not include zero, there is a real positive indirect effect of CSA on infectious disease diagnoses through their clinically significant anxiety levels. Regarding the other two mediators studied, Figure 1 indicates the absence of indirect effects of CSA on infectious diseases through PTSD and non-anxious psychiatric disorders. Although the only significant mediator was anxious disorders, the total effect and the total indirect effect of the model are significant. Overall, 30% of the total effect of CSA on infectious diseases was explained by the number of consultations and hospitalizations related to anxious disorder diagnoses after the substantiated report of sexual abuse.

Discussion

The main goal of the current study was to determine whether the link between CSA and the frequency of consultations and hospitalizations for infectious diseases during childhood and adolescence was explained by the presence of PTSD diagnoses following CSA, while controlling for variables, such as the material and social deprivation indexes, and while comparing PTSD with other mental disorders, such as anxious disorders. Findings suggest that CSA is associated with a range of mental health problems for which youth consult or are hospitalized following CSA, such as PTSD and anxious disorders. These results add to growing empirical support of the association between CSA and mental health problems (e.g., Chang et al., 2018; Daigneault et al., 2017; Irish et al., 2010; Vézina-Gagnon et al., 2018).

A novel result of the present study that was not anticipated suggests that CSA predicts more infectious diseases diagnoses through the emergence of anxious disorders in general, rather than specifically through PTSD. Indeed, results show that sexually

abused children and adolescents have more consultations and hospitalizations for anxious disorders than youth from the general population, which in turn leads to more infectious diseases. These findings therefore explain why CSA has been shown to be associated with a higher prevalence of infectious diseases in youth following CSA (Dargan et al., in revision), by showing that anxious disorders diagnosed after a CSA report carry or explain at least a third of that effect.

This result appears to contradict the initial hypothesis that PTSD explains the impact of CSA on infectious diseases. Several hypotheses could explain this result. It is possible that the prevalence of youth with PTSD is underestimated in the current study. In fact, a recent study of a sample of Canadian children showed that approximately 54% of the sample of abused children met the diagnostic criteria of PTSD (Hébert et al., 2016). The PTSD prevalence appears to be higher in recent studies than in the current one and several explanations can be considered. First, because data on participants' mental health in the present study are available through physician diagnoses, it is possible that youth in the sample do not often consult physicians about their mental health. Secondly, even though a sexual abuse report was corroborated by child protection agencies, physicians may not have known that these children and adolescents were victims of CSA. Ignorance of the trauma could then prevent them from diagnosing PTSD. Because there may be comorbidity between anxiety and PTSD (e.g., Ginzburg, Ein-Dor, & Solomon, 2010; Spinhoven et al., 2014), a diagnosis of anxiety may have been made. In short, because the present study's method is not a self-report questionnaire and participants must have gone to a physician for a diagnosis, the actual prevalence of PTSD may be underestimated.

Beyond the potential problems of diagnosing PTSD, there are other factors that may explain why anxiety mediates the association between CSA and infectious diseases. Indeed, several studies have shown that anxiety is one of the psychological consequences of CSA (e.g., Afifi et al., 2014; Fergusson, McLeod, & Horwood, 2013). Furthermore, a recent study has also shown that anxiety mediates the association between CSA and genito-pelvic pain (Santerre-Baillargeon, Vézina-Gagnon, Daigneault, Landry, & Bergeron, 2016). It is therefore possible that among sexually abused children, the anxiety caused by this traumatic experience may in turn lead to disorders of the immune system, which can then lead to physical problems, such as genito-pelvic pain and infectious diseases.

Furthermore, recent analyses performed on the same database indicated the presence of a complex PTSD profile in 11% of children and adolescents (Alie-Poirier, Daigneault, Hébert, & McDuff, under review). This complex PTSD profile is characterized by at least one diagnosis in at least four diagnostic categories (e.g., conduct, emotion, or social functioning disorders with childhood onset, somatoform and dissociative disorders; anxiety disorders; and phobias). Because this complex PTSD diagnosis did not appear in the ICD-9 or 10 but only in the ICD-11, it is possible that physicians gave a series of other diagnoses than PTSD when faced with complex PTSD-like symptoms.

Strengths and limitations of the study

The use of a prospective matched-cohort design with longitudinal administrative data represents an important strength of this study. Indeed, this design allowed the documentation of an important number of variables over a long period of

time, allowing us to better understand the complex etiology of physical and psychological health problems related to CSA. It also avoids recall biases and social desirability associated with the use of a retrospective self-report design, which is often found in abuse surveys (Brewin, Andrews, & Gotlib, 1993; Straus, 1998). The large size of the sample represents a strength of the study in that it generates a high statistical power to detect small effects while controlling for confounders such as the socio-economic level. Moreover, the design of the study can document several variables in a chronological sequence, which makes it possible to respect the temporal causal steps of the model.

However, the use of this design also represents a limitation, as data were restricted to those collected by the health insurance agency and child protection agency, which can represent only a small percentage of sexually abused children (Brownell & Jutte, 2013) and those with mental health disorders or infectious diseases. Also, we cannot be certain that participants from the general population did not experience sexual abuse, even in the absence of a substantiated report of sexual abuse. In fact, several participants from the GP group will certainly have experienced sexual abuse in childhood. This tends to diminish the differences between the two groups and, thus, underestimates the risk of physical and mental health problems associated with CSA (Daigneault et al., 2017).

Clinical implications and future research

The current study has implications for researchers and practitioners. First, it supports the validity of examining the harmful impact of CSA on the survivors' mental and physical health. It also further suggests the merit of studying CSA's psychological and physical consequences in the shorter term, before chronic diseases of adulthood

occur. The present research indeed contributed to our understanding of the short-term effects of CSA, such as PTSD, anxious disorders, and infectious diseases, and highlighted the need to offer sustained mental health services to sexually abused youth and to intervene to prevent CSA and reduce its human, social, and financial costs.

Beyond the direct association between CSA and infectious disease diagnoses, the present study reveals that it is through the development of an anxious disorder that this link is exerted. This finding highlights the importance of developing prevention and intervention programs for sexually abused children and adolescents with anxious disorder symptoms to prevent the onset of physical health problems, such as infectious diseases. Future studies should replicate those findings to further emphasize the importance of intervention for sexually abused youth with anxious disorder symptoms. It would also be interesting to investigate whether anxious disorders can explain the consequences of CSA on various physical health problems other than infectious diseases, such as somatic complaints, cardio-respiratory diseases, and asthma.

Table 1

ICD-10 specific diagnostic categories included in the study

Variables of study	ICD-10 Diagnostic categories included in the study	Examples of specific diagnoses
PTSD	Reaction to severe stress, adjustment disorders (F43)	Acute stress reaction, PTSD, adjustment disorders
Anxious disease	Phobic anxiety disorders (F40)	Social phobias, specific (isolated) phobias
	Other anxiety disorders (F41)	Panic disorder, other mixed anxiety disorders
	Obsessive-compulsive disorder (F42)	Obsessive-compulsive disorder, unspecified
Non-anxious psychiatric disease	Organic, including symptomatic, mental disorders (F00-F09)	Organic personality disorder
	Mental and behavioral disorders due to psychoactive substance use (F10-F19)	Mental and behavioral disorders due to use of alcohol, opioids, cannabinoids, and/or cocaine
	Schizophrenia, schizotypal, and delusional disorders (F20-F29)	Schizophrenia, persistent delusional disorders
	Mood (affective) disorders (F30-F39)	Bipolar affective disorder, depressive episodes, persistent mood disorders
	Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	Eating disorders
	Disorders of psychological development (F80-F89)	Specific developmental disorders of speech and language, specific developmental disorders of motor function, mixed specific developmental disorders
	Behavioral and emotional disorders with onset usually occurring in childhood and adolescence (F90-F98)	Hyperkinetic disorders, conduct disorders

Table 2

Descriptive statistics (unadjusted means and standard deviations) and Pearson correlation matrix of the number of consultations and hospitalisations for PTSD, anxious disorders, non-anxious disorders, and infectious diseases, by children and adolescents with a substantiated sexual abuse (SA group; N = 882) and from the general population (GP group; N = 882)

Psychiatric category	SA		GP		1	2	3	4
	M	*SD*	*M*	*SD*				
1. PTSD	1.73	5.73	0.45	2.71	-			
2. Anxious disorders	2.33	7.61	0.61	3.27	0.33**	-		
3. Non-anxious disorders	9.31	28.70	2.28	10.40	0.37**	0.46**	-	
4. Infectious diseases	6.52	8.16	5.59	6.92	0.11**	0.19**	0.14**	-

**$p < 0.01$.

Table 3

Proportion of children and adolescents with a substantiated report of sexual abuse (N = 882) and from the general population (N= 882) with at least one diagnosis after the CSA report and before an infectious disease in each diagnostic category

Psychiatric category	SA		GP	
	N	%	N	%
PTSD	206	23.36	80	9.07
Anxious disorders	263	29.81	102	11.56
Non-anxious psychiatric disorders	449	50.91	195	22.11
No diagnosis in any category	356	40.36	625	70.86
At least one diagnosis in only one of the three diagnostic categories	247	28.00	167	18.93
At least one diagnosis in categories 1) and 2)	7	0.79	9	1.02
At least one diagnosis in categories 1) and 3)	71	8.05	21	2.38
At least one diagnosis in categories 2) and 3)	88	9.98	30	3.40
At least one diagnosis in every category	113	12.81	30	3.40

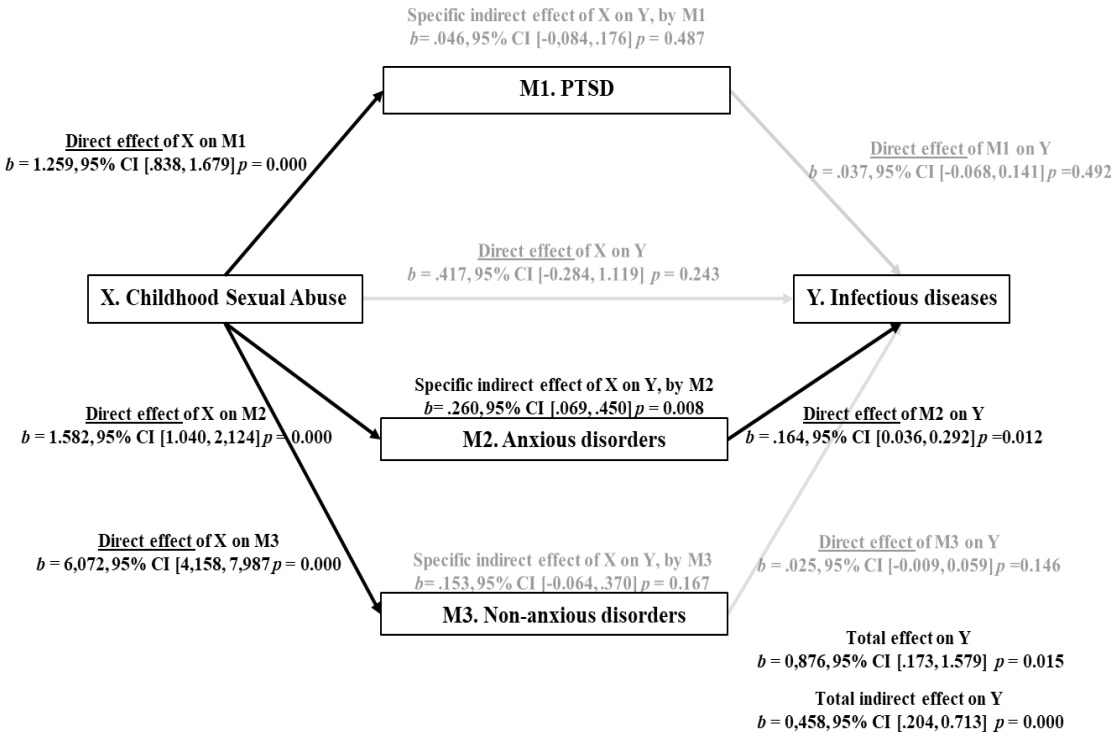

Figure 1. Path analysis model for childhood sexual abuse, infectious diseases, PTSD, anxious disorders, and non-anxious disorders. The *b* represents the unstandardized regression coefficient. The 95% confidence intervals (CIs) for total, direct, and indirect effects were created by maximum likelihood estimation with robust standard errors. The model controls for age, sex, time of exposure, material and social deprivation indexes, infectious diseases and mediating variables occurring before the CSA report, and infectious diseases occurring between the CSA report and the first occurrence of a mediating variable.

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