This article has been accepted for publication in the Journal of Clinical Sleep Medicine published by the American Academy of Sleep Medicine: 10.5664/jcsm.10736

Running head: CSA AND ADOLESCENT SLEEP

The Association Between Childhood Sexual Abuse and Subjective Sleep in Adolescent Girls

Rachel Langevin, PhD, Assistant Professor, Department of Educational and Counselling Psychology, McGill University, Canada Marie-Hélène Pennestri, PhD, Associate Professor, Department of Educational and Counselling Psychology, McGill University, Canada and Hôpital en santé mentale Rivière-des-Prairies (CIUSSS-NIM), Canada Malka Hershon, BSc, graduate student, Department of Educational and Counselling Psychology, McGill University, Canada and Hôpital en santé mentale Rivière-des-Prairies (CIUSSS-NIM), Canada Teresa Pirro, MA, graduate student, Department of Educational and Counselling Psychology, McGill University, Canada Martine Hébert, PhD, Full Professor, Département de sexologie, Université du Québec à Montréal, Canada and Tier 1 Canada Research Chair on Interpersonal Trauma and Resilience

Corresponding author: Martine Hébert Département de sexologie Université du Québec à Montréal, C.P. 8888, Succursale Centre-Ville, Montréal, Québec, Canada H3C 3P8 Email: <u>hebert.m@uqam.ca</u>

Institution where the work was performed: Université du Québec à Montréal

All authors have seen and approved the manuscript and have no conflict of interest or financial interests to declare.

Financial support:

Drs. Langevin and Pennestri are supported by Chercheur-Boursier Awards from the Fonds de recherche du Québec – Santé. They both hold a William Dawson Award from McGill University. This project was supported by a grant from Canada Research Chairs Program awarded to Dr. Hébert. Teresa Pirro and Malka Hershon have no financial support to declare.

Authors have not conflict of interest to disclose.

This manuscript is not based on a clinical trial.

Number of tables: 2 Number of figures: 0 Abstract word count: 202 words Brief summary word count: 116 words Manuscript word count: 4206 excluding references and tables

Abstract

Background. Child sexual abuse (CSA) is associated with negative consequences on both physical and mental health. It has been found to influence child and adolescent sleep, which is an important developmental factor, which also influences mental and physical health. However, the literature examining this topic is plagued by methodological limitations, such as small sample sizes and unvalidated measures.

Objectives and Methods. Using the *Pittsburgh Sleep Quality Index*, the present study examined seven subjective sleep dimensions including, sleep latency, efficiency, duration, disturbances, subjective sleep quality, daytime dysfunction, and use of sleep medication, in a sample of 707 adolescent girls aged 14-18 years old.

Results. Statistical analyses revealed that CSA had a significant moderate association with the total PSQI score. Sexually abused adolescent girls, compared to their non-abused counterparts, reported more sleep difficulties. Significant differences also emerged on all sleep dimensions with abused girls reporting increased difficulties. However, the magnitude of these associations differed from one dimension to another.

Conclusions. Our findings support the continued study of sleep in adolescent girls who experienced sexual abuse. They also support the use of a fine-grained perspective when assessing various dimensions of sleep health in girl with a history of CSA for improved tertiary prevention and intervention.

Keywords: child sexual abuse (CSA), sleep, sleep disturbances, adolescents, trauma

Brief Summary

Study Rationale. Studies suggest a negative impact of child sexual abuse (CSA) on youth's sleep. However, this literature is plagued with methodological shortcomings, including a lack of differentiation between the various sleep dimensions and the use of unvalidated measures. The current study compares subjective sleep difficulties of adolescent girls who experienced CSA to their non-abused peers using the *Pittsburgh Sleep Quality Index*.

Study Impact. Differences in subjective sleep quality, sleep latency, and the use of sleep medication appeared particularly salient when comparing abused and non-abused girls. Given the central role of sleep in healthy development, helping adolescent girls with a history of CSA sleep better should be the focus of sustained efforts in research and practice.

1. Introduction

Child sexual abuse (CSA) is conceptualized as non-consensual sexual behaviors, with or without contact, inflicted on children under the age of 18.1 CSA is a major social concern with a worldwide prevalence of 8% for men and more than double this rate for women (20%).² In comparison to other maltreatment experiences, CSA is unique given the combined effect of four traumagenic dynamics, namely traumatic sexualization, betrayal, stigmatization, and powerlessness.³ As such, victims of CSA report experiencing more negative consequences than victims of other forms of child maltreatment, including internalizing and externalizing behavior problems, neurodevelopmental (e.g., altered neurogenesis), and psychological (e.g., mood disorders) challenges.^{4,5} Systematic reviews have concluded that CSA in children and adolescents is also associated with sleep problems, such as nightmares and nocturnal awakenings; this effect being even more pronounced for girls.⁶ Although there is an emerging body of literature on the topic of CSA and sleep in adolescent girls, these systematic reviews have outlined important methodological shortcomings in the current literature (e.g., small sample sizes, use of unvalidated measures, and non-comprehensive assessment of sleep in terms of dimensions or difficulties).⁶ Therefore, the current investigation aims to bridge some of these gaps by comparing sexually abused and non-abused adolescent girls on various subjective sleep dimensions.

Sleep is a fundamental component of one's life, especially in highly sensitive developmental periods, such as early childhood and adolescence.⁷ It is associated with healthy brain and affective development, mental and physical health, academic outcomes, learning, and memory.⁸⁻¹⁰ Medical guidelines recommend that typical adolescents sleep 8 to 10 hours to ensure adequate functioning.¹¹ Despite this recommendation, in a large Canadian sample, Michaud and

Chaput¹² found that 30% of adolescents sleep less than recommended guidelines for optimal health, and 42% of adolescents report having trouble falling or staying asleep. Furthermore, it has been shown that adolescent girls report more sleep problems than boys, including longer sleep onset latency and poorer subjective sleep quality.^{13,14} These gender differences remain in adulthood, as insomnia is more prevalent in women than men.¹⁵ Therefore, sleep difficulties pose a threat to healthy developmental trajectories, even in non-clinical populations of adolescent girls.

In response to experiences of trauma, it is common to experience sleep difficulties.^{6,16,17} Specifically, after experiencing CSA, posttraumatic stress disorder, anxiety, and depression symptoms often developed, which are associated with and even include sleep difficulties as part of the core symptomatology.¹⁶⁻²⁰ As a result, CSA has the potential to interfere with several sleep dimensions, particularly the capacity to fall asleep, stay asleep, and get restful sleep, directly and indirectly through mental health difficulties. These sleep difficulties have all been identified in systematic reviews on the topic.⁶ However, these reviews covered a large age range, with only a few studies focusing more specifically on adolescents, despite the age-specific developmental aspects of sleep. For instance, Mignot et al.²¹ found that adolescent victims of CSA reported lower sleep satisfaction, and more frequent nightmares and nocturnal awakenings in comparison to their non-abused counterparts. However, this was documented in a mixed sample of 1719 girls and boys using unvalidated measures of sleep and CSA. Moreover, in a small sample of 24 adolescent girls using an unvalidated sleep measure. Keeshin and colleagues²² found that victims of sexual abuse reported experiencing more sleep difficulties, measured as either having difficulty falling asleep, nightmares, or more awakenings, than their non-abused counterparts.

Taken together, these studies suggest a negative impact of CSA on sleep in adolescent girls. However, this literature is limited by: the reliance on small samples; little consideration for developmental specificities as well as sex and gender differences related to sleep and CSA; a lack of differentiation between the various sleep health dimensions; and most importantly, the use of unvalidated measures to document sleep and CSA.⁶ In this context, the current study aimed to compare subjective sleep difficulties of adolescent girls who experienced CSA to their non-abused peers using a gold-standard questionnaire, the *Pittsburgh Sleep Quality Index* (PSQI). Given that sleep is a multi-dimensional concept²³ and that CSA could impact some sleep latency, efficiency, duration, disturbances, and quality, as well as daytime dysfunction, and use of sleep medication. It was hypothesized that sexually abused girls would report having overall worse sleep than non-abused girls. Given the sparse empirical literature on the topic, no hypotheses were formulated regarding specific sleep dimensions that may be more impacted by CSA.

2. Materials and Methods

2.1 Participants

A sample of 776 adolescent girls aged 14 to 18 (M = 16.04, SD = 1.28) from the Province of Quebec, Canada, was recruited online using the secure platform Qualtrics. Most participants self-identified as Canadians (88.1%). They were allowed to select more than one ethnicity and 3.4% identified as Indigenous/Metis, 4.0% as Latinx, 3.7% as Black, 2.8% as Asian, 8.8% as West Europeans, 2.1% as East Europeans, 2.5% as Caribbeans, and 2.5% as North African/Middle Easterner. Using their postal codes,²⁴ participants were classified in quintiles based on their neighborhood's material deprivation index. A quarter of participants lived in very privileged neighborhoods, about a fifth of participants lived in either privileged, average, or underprivileged neighborhoods, and about 15% of participants lived in very underprivileged neighborhoods. After the data was cleaned to exclude non-eligible participants, a sample of 707 adolescent girls remained: 54 were excluded because they did not self-identify as girls, 13 because they were not aged between 14 and 18 years old, one because she did not live in Quebec, and one because she did not answer the question documenting CSA.

2.2 Procedure

Participants wanting to partake in the study were recruited by means of posting on social media and asked to give their informed consent electronically. In accordance with the regulation in effect in the Province of Quebec, parental consent was not required since participants were 14 years and older. Participants were then asked to fill out an anonymous online survey on Qualtrics which took approximately 25 minutes to complete. Participants who completed the survey were then entered in a draw to win a \$50 gift card. The current procedure was approved by the Research Ethics Board of the Université du Québec à Montréal.

2.3 Measures

2.3.1 Sociodemographics

Participants were asked to complete a sociodemographic questionnaire. Of relevance to the current analysis ethnicity/cultural background and date of birth were obtained.

2.3.2 Subjective Sleep

Subjective sleep was measured with the PSQI.^{25,26} The PSQI examines seven dimensions of sleep, using participant self-reports on a 4-point Likert scale ranging from 0 to 3 (e.g., *not during the past month* to *three or more times a week*; *very good* to *very bad*). Documented sleep dimensions include: 1- subjective sleep quality (1 item); 2- sleep latency (2 items); 3- sleep duration (1 item); 4- sleep efficiency (time spent asleep/time in bed), 5- sleep disturbances (9

sub-items); 6- use of sleeping medication (1 item); and 7- daytime dysfunction (2 items). In line with the original coding instructions, answers were recoded into a 0-3 score for each of the seven dimensions²⁵ with higher scores reflecting greater difficulties. A total aggregate score was obtained by summing all the PSQI components resulting in a total score ranging from 0-21 with increasing scores reflecting increasing sleep difficulties. In the original validation study, the PSQI had a Cronbach's alpha of .83.²⁵ The PSQI was also validated for use with community-based adolescents²⁷. In the current study, Cronbach's alpha is .67. This questionnaire was validated in a French sample.²⁷

2.3.3 Child Sexual Abuse

Having a history of CSA was self-reported using an item adapted from previous studies: "Has anyone touched you sexually when you did not want it or has anyone coerced or manipulated you into having sex".

2.4 Statistical Analysis

Analyses were conducted using SPSS 28. A visual examination was done to identify anomalies in answers and scores, and anomalies were recoded as missing (some PSQI scores for three participants). Spearman's Correlations between dependent variables were computed. A *t*test was run to compare CSA and non-CSA participants on age and a Chi-square analysis was performed to compare them on nationality. Since there was no age or nationality difference between groups, further analyses were performed without covariates. As scores for all sleep dimensions are ordinal and not normally distributed, Mann-Whitney U Tests were deemed suitable to compare groups on sleep dimensions. A *t*-test was used for the total sleep score comparison. Preliminary analyses were done to compare the distributions of scores in the CSA and no-CSA groups and to determine if the Mann-Whitney U Test should be done comparing the medians or the mean ranks between groups.

3. Results

3.1 Preliminary Analyses

In our final sample, 62% of adolescent girls reported no history of CSA (n = 439) and 38% of them did (n = 268). All PSQI scores were correlated with one another in the complete sample (Table 1). Table 2 displays means, standard deviations, medians, and sample sizes for each PSQI dimension and the total PSQI score separated by groups. Between 0.43% and 4.66% of participants had missing data on a PSQI dimension and 6.78% were missing for the total score; listwise deletion was used with these cases. Participants in the CSA and no-CSA groups did not significantly differ in terms of age ($M_{CSA} = 16.16 \pm 1.24$; $M_{n-CSA} = 15.97 \pm 1.31$; t (705) = -1.875, p = .061) and nationality (CSA = 89.9% Canadians; Non-CSA = 87.0% Canadians; χ^2 (1, N = 706) = 1.370, p = .242). Since sleep efficiency, subjective sleep quality, sleep duration, use of medication, and daytime dysfunction were distributed similarly across groups, the Mann-Whitney U Test was used to compare medians. The Mann-Whitney U Test was used to compare medians. The Mann-Whitney is used to compare medians are distributed similarly across groups.

3.2 PSQI Total Sleep Score

The total sleep problems score was significantly higher in sexually abused adolescents than non-abused adolescents (see Table 2). The Cohen's d value was -0.587 representing a robust effect size of CSA on the PSQI total score. Using total scores of more than 5 as the clinical cutoff,²⁵ Chi-square analyses revealed that girls in the CSA group were more likely than girls in the no-CSA group to report clinical levels of sleep difficulties (86.6% vs. 67.1%): χ^2 (1, *N* = 659) = 30.79, *p* < .001.

3.3 PSQI Sleep Dimensions

Results displayed in Table 2 show that the subjective sleep quality dimension differed between groups with sexually abused girls reporting lower sleep quality than non-abused girls. More than half of non-abused girls (58.8%) compared to 43.4% of non-abused girls reported good or very good sleep quality. Significant but small differences also emerged with the sleep duration dimension. Specifically, when looking at the mean hours of sleep per night, girls in the CSA group reported 6.9 hours per night (SD = 1.34; median = 7, 25th percentile = 6, 75th percentile = 8) and non-abused girls reported sleeping 7.3 hours per night (SD = 1.28; median = 7, 25^{th} percentile = 7, 75^{th} percentile = 8). The CSA group also had a statistically lower sleep efficiency dimension than the no-CSA group. Sexually abused adolescent girls reported slightly lower sleep efficiency than non-abused girls; the mean percent efficiency was 89% (SD = 10.4%; median = 91%, 25^{th} percentile = 83%, 75^{th} percentile = 91%) for non-abused girls and 87% (SD = 12.4%; median = 89%, 25^{th} percentile = 80%, 75^{th} percentile = 100%) for abused girls. Girls in the CSA group reported using more sleep medication than those in the no-CSA group. An examination of the distributions of scores show that non-abused girls reported not using sleep medication in the past month in 71.6% of cases, while this was found to be in 59.4% of cases for abused girls. Conversely, 9.8% of non-abused girls reported using sleep medication ≥ 3 times per week in comparison to 22.6% in the abused group. Sexually abused adolescent girls reported greater daytime dysfunctions compared to non-abused girls. More specifically, while examining the distributions, a quarter to a third (28.5%) of sexually abused girls reported frequent difficulties staying awake and maintaining their enthusiasm for activities, while this proportion was a fifth for non-abused girls (19.2%).

Furthermore, results show a significant difference between the CSA and no-CSA groups in the sleep latency dimension, with abused girls showing longer latency than non-abused girls. An examination of the distributions in minutes revealed that sexually abused adolescent girls reported a mean sleep latency of 43 minutes (SD = 33; median = 30, 25th percentile = 20, 75th percentile = 60), while their non-sexually abused counterparts had a mean latency of 32 minutes (SD = 28; median = 20, 25th percentile = 15, 75th percentile = 45). Similarly, adolescent girls in the CSA group reported greater sleep disturbances than those in the non-CSA group. Thus, by examining the distributions of scores, non-sexually abused girls reported none or few sleep disturbances in 69.8% of cases, while it was only true for 50.9% of sexually abused girls.

4. Discussion

This study aimed to compare sexually abused and non-abused adolescent girls on various subjective sleep dimensions using a large sample and a gold-standard measure of sleep. In line with our hypotheses, results showed that sexually abused adolescent girls, compared to their non-abused counterparts, reported more sleep difficulties both in terms of their continuous total scores and clinical levels of difficulties. CSA had a moderate effect size on the total PSQI score. While significant differences emerged on all sleep dimensions, differences in terms of sleep duration and efficiency were small and likely not clinically significant. However, more important differences emerged for subjective sleep quality, sleep latency, and use of sleep medication. While most non-abused girls were satisfied with their sleep quality, more than half of abused girls were dissatisfied. Sexually abused girls reported taking approximately 30% more time to fall asleep (43 versus 32 minutes) and twice as many of them, despite their young age, reported a frequent use of sleep medication. Relatedly, moderate differences were apparent in the amount of sleep disturbances and of daytime dysfunction reported in both groups. These findings support

the relevance of adopting a more fine-grained perspective when assessing sleep in sexually abused adolescent girls for research or intervention purposes.

Our findings mostly align with the previous body of literature on sleep and CSA. Xiao and colleagues²⁸ found that adolescent victims of CSA had heightened sleep problems as measured by the PSQI when compared to non-abused adolescents. Similar findings were reported with a sample of Turkish adolescents²⁹ as well as with younger children in foster care.³⁰ While our results regarding sleep duration and efficiency were likely not clinically significant, past studies also have found significant differences on these sleep variables both with femaleonly and mixed samples.^{21,22,31,32} However, in a mixed child and adolescent sample of boys and girls, Sadeh and colleagues³³ reported no associations between CSA and sleep efficiency, as measured by nocturnal awakenings.

Additionally, consistent with our findings, previous literature has shown that adolescent girl and boy victims of CSA were less satisfied with their sleep than their non-abused peers.²¹ In contrast, Wamser-Nanney and Chesher³⁴ found no difference on sleep satisfaction; this difference may be attributed to the mixed girls and boys sample used, given that the current investigation used a girl only sample. Furthermore, Mignot et al.²¹ and Turner et al.³² reported findings similar to ours where CSA victims reported greater difficulties falling asleep than non-victims in mixed samples of boys and girls. However, this was also found in a sample of boys only.³⁵ Nonetheless, studies did not find an association between CSA and sleep onset latency in samples of children and adolescents.^{33,34} Overall, our findings are consistent with the current body of literature, emphasizing that sleep difficulties are more prevalent in victims of CSA.

Lower subjective quality and longer sleep latency for CSA victims compared to nonvictims were particularly salient in the present study. This finding is consistent with the hyperarousal theory underlying both insomnia and trauma etiology. Specially, studies conducted in insomnia patients show increased hyperarousal state as measured by several markers, such as higher frequency electroencephalographic (EEG) activity, increased blood pressure, elevated heart rate, and increased cortisol level.³⁶⁻³⁸ Low sleep quality in CSA individuals likely reflect high levels of vigilance and physiological arousal during sleep, symptoms that are integral to posttraumatic stress.^{39,40} Moreover, fear of sleep may play an important role in reducing sleep quality and increasing sleep latency⁴¹ in sexually abused girls. Although present in several types of traumas, fear of sleep might be particularly associated with CSA, since these traumatic experiences often occur in a sleep environment (e.g., in bed) at night or in the dark. Future studies could directly examine these potential mechanisms underlying the associations between CSA and sleep difficulties.

The increased use of sleep medication reported by sexually abused girls in our sample is also an important finding. In adults, insomnia is a highly prevalent disorder, with a clearly higher prevalence in women.¹⁵ Women are also more likely to use sleep medication or to report a need to treat their sleep difficulties.^{42,43} While the psychophysiological mechanisms leading to insomnia are not completely understood, it is believed to be multifactorial and often the result of the presence of predisposing factors (e.g., genetic vulnerability), precipitating factors (e.g., acute stress), and perpetuating factors (e.g., poor sleep habits). Therefore, early traumatic experiences such as CSA likely precipitate the development of insomnia in some women. Moreover, the use of sleep medication and poor sleep habits could act as perpetuating factors. While the PSQI does not provide details regarding the specific medication used, considering that non-pharmacological interventions are preferable as an effective and safe first-line therapy for insomnia,⁴⁴ it remains concerning to observe high rates of medication usage in this community sample of adolescent

girls following CSA. Whether this finding is generalizable to other young vulnerable populations remains to be determined.

While our study did not aim to document sleep difficulties in a general population of adolescent girls, some of our findings to that effect warrant a short discussion. Consistent with past studies,¹²⁻¹⁴ our results reveal significant sleep difficulties in both abused and non-abused girls. A striking result is that almost 68% of non-abused girls reached the clinical threshold of the PSQI for sleep difficulties. Many non-abused girls reported using sleep medication in the past month (28%), experiencing daytime dysfunction (19%), and experiencing some form of sleep disturbances (30%). Both abused and non-abused girls reported sleeping on average 8 hours a night, which is the minimum recommended for adolescents. Thus, our findings align with the perfect storm metaphor proposed by Carskadon.⁴⁵ This metaphor highlights that adolescents are faced with conflicting bioregulatory (i.e., circadian phase delay), psychosocial (e.g., self-selected bedtimes, social networking, and availability/use of technology delaying sleep), and societal pressures (i.e., early rise for school) regarding their sleep timing that result in insufficient sleep and daytime dysfunction. Given the major implications of sleep for physical and psychological health and for healthy development in adolescence, these concerning results emphasize the need to examine more closely sleep in girls, sexually abused or not.

4.1 Limitations and Implications for Research and Practice

The current study has many strengths including the large sample of adolescent girls with over 250 of them reporting a history of CSA, affording sufficient statistical power to conduct our analyses. The use of a gold-standard measure of subjective sleep difficulties is also a strength and so is the examination of various sleep health dimensions. Notwithstanding these contributions, some limitations must be acknowledged. There is some debate regarding the use of the PSQI dimension scores, and the factor structure with seven dimensions was not replicated in the validation study with an adolescent sample.²⁷ We did not use a validated measure to assess CSA and only self-reports were considered; a multi-method assessment of CSA (e.g., official records and validated self-reported with several questions) and the examination of CSA characteristics (e.g., severity and chronicity) that may be differentially associated with sleep dimensions is desirable in future research. We had limited information on the sociodemographic characteristics of our participants (e.g., schooling, income, and sexual orientation) and their family of origin (e.g., family income, parent education and occupation). Based on the information we had, ur sample was not very ethnically/racially diverse, therefore, our findings might not be representative of more diverse populations of adolescent girls. The high percentage of our sample reporting experiencing a sexual abuse (39%) compared to other studies^{46,47} could reflect some biases that may have been introduced by our online recruitment strategy targeting adolescent girls who wished to share their experiences in romantic relationships. It could also be related to the item that we used that defines CSA rather broadly compared to measures used in other studies, or to the increased awareness brought upon by recent movements such as #MeToo.⁴⁸ Future studies could replicate our findings using a more diverse and representative population. Given possible gender specificities identified in past studies, exploring the associations between CSA and the different dimensions of sleep in boys would also be interesting and provide relevant cues for intervention.

Expanding on our study, future research could explore the interplay between CSA, sleep, and posttraumatic symptomatology and consider possible mediating and moderating factors of the association between CSA and sleep in adolescent girls (e.g., psychopathology, CSA characteristics, and social and professional support received). Exploring the impact of sleep difficulties in CSA survivors' recovery would be another worthy avenue for future research. Longitudinal studies of CSA survivors could also help determining the importance of early trauma in the development and maintenance of adulthood insomnia and other sleep difficulties such as recurrent nightmares. Using a quantitative-qualitative mixed methodology could provide rich information on the lived experiences and individual perspectives of victims regarding potential mechanisms underlying sleep difficulties following CSA. This could also contribute to the development of a theoretical model of the impact of CSA on sleep that could orient future research and clinical practice.

Our findings have some implications for health practitioners, especially if replicated. Screening for sleep problems in adolescent girls with a history of CSA could be relevant and a fine-grained assessment of the sleep health dimensions impacted should follow to orient intervention. Cognitive-behavioral therapy for insomnia (CBT-i) is the recommended treatment for insomnia in adults, but also in adolescents, and should be prioritized over medication.⁴⁹ Adolescence is already a vulnerable developmental period regarding sleep, where biological, psychological, and sociocultural influences interact, leading to sleep loss and decreased sleep regulation.^{45,50} Therefore, very special attention should be paid to vulnerable adolescents, such as sexually abused adolescent girls.

5. Conclusion

The current study contributed to the literature by documenting associations between various sleep dimensions and having a history of CSA in adolescent girls. Differences in subjective sleep quality, sleep latency, and the use of sleep medication appeared particularly salient when comparing abused and non-abused girls. More research is needed to deepen our understanding of the mechanisms underlying these associations. Given the central role of sleep in healthy developmental trajectories, helping adolescent girls with a history of CSA sleep better could foster their recovery and resilience; this could be the focus of sustained efforts in research and practice.

Acknowledgements

We wish to thank our participants without whom this project would not have been possible. Special thanks to Manon Robichaud for her data management throughout this project.

Abbreviations

CSA: Child sexual abuse

PSQI: Pittsburgh Sleep Quality Index

Table 1

Spearman's Rho Correlations between Study Variables

	1	2	3	4	5	6	7
1. Subjective sleep quality							
2. Sleep latency	.384***						
3. Sleep duration	.452***	.236***					
4. Habitual sleep efficiency	.230***	.255***	.377***				
5. Sleep disturbances	.287***	.287***	.152***	.183***			
6. Use of sleep medication	.189***	.232***	.098*	.136***	.217***		
7. Daytime dysfunction	.325***	.167***	.252***	.110**	.223***	.152***	
8. Total sleep score	.669***	.671***	.550***	.502***	.506***	.524***	.538***

 $\overline{p < .05; ** p < .01; *** p < .001}$

Table 2

Description of PSQI Scores

Scores	CSA	No-CSA	CSA	No-CSA	CSA	No- CSA	Statistical Test
	M (S	M (SD)		Median		n	Mann-Whitney U / t-test
Subjective sleep quality	1.64 (0.73)	1.39 (0.71)	2	1	267	437	68,788.00***
Sleep latency	1.94 (0.97)	1.51 (1.00)	2	1	260	422	41,840.00***
Sleep duration	0.60 (0.83)	0.34 (0.69)	0	0	252	427	62,680.00***
Habitual sleep efficiency	0.60 (0.90)	0.42 (0.76)	0	0	250	424	58,233.00**
Sleep disturbances	1.52 (0.61)	1.30 (0.54)	1	1	267	437	46,858.00***
Use of sleep medication	0.93 (1.25)	0.55 (0.99)	0	0	266	437	66,650.50***
Daytime dysfunction	1.91 (0.87)	1.70 (0.85)	2	2	267	437	66,221.50**
Total sleep score (t-test)	9.11 (3.50)	7.18 (3.16)	9	7	246	413	-7.287***

Note. The scores displayed here are from the 0-3 score for each sleep dimension except for the total score that can range from 0-21.

* p < .01; **p < .01; *** p < .001.

References

- Responding to children and adolescents who have been sexually. WHO website. www.who.int/publications-detail-redirect/9789241550147. Published October 13, 2017. Accessed June 1, 2022.
- Stoltenborgh M., Van Ijzendoorn MH, Euser EM, Bakermans-Kranenburg MJ. A global perspective on child sexual abuse: meta-analysis of prevalence around the world. *Child Maltreat.* 2011;16(2):79-101.
- 3. Finkelhor D, Browne A. The traumatic impact of child sexual abuse: a conceptualization. *Am J Orthopsychiatry*. 1985;55(4):530-541.
- Humphreys KL, LeMoult J, Wear JG, Piersiak HA, Lee A, Gotlib IH. Child maltreatment and depression: a meta-analysis of studies using the childhood trauma questionnaire. *Child Abuse Negl.* 2020;102:104361.
- Lewis T, McElroy E, Harlaar N, Runyan D. Does the impact of child sexual abuse differ from maltreated but non-sexually abused children? A prospective examination of the impact of child sexual abuse on internalizing and externalizing behavior problems. *Child Abuse Negl.* 2016;51(2016):31-40.
- Langevin R, Kenny S, Kern A, Kingsland E, Pennestri M-H. Sexual abuse and sleep in children and adolescents: a systematic review. *Sleep Med Rev.* 2022;64:101628.
- Williamson AA, Mindell JA, Hiscock H, Quach J. Sleep problem trajectories and cumulative socio-ecological risks: birth to school-age. *J Pediatr*. 2019;215(4):229-237.
- Feinberg I, Campbell IG. Sleep EEG changes during adolescence: an index of a fundamental brain reorganization. *Brain Cogn.* 2010;72(1):56-65.

- Raniti MB, Allen NB, Schwartz O, et al. Sleep duration and sleep quality: associations with depressive symptoms across adolescence. *Behav Sleep Med.* 2016;15(3):198-215.
- Touchette E, Petit D, Tremblay RE, Montplaisir JY. (2009). Risk factors and consequences of early childhood dyssomnias: new perspectives. *Sleep Med Rev*. 2009;13(5):355-361.
- 11. Hirshkowitz M, Whiton K, Albert SM, et al. National sleep foundation's updated sleep duration recommendations: final report. *Sleep Health.* 2015;1(4):233-243.
- Michaud I, Chaput J-P. Are Canadian children and adolescents sleep deprived? *Public Health.* 2016;141:126-129.
- Galland BC, Gray AR, Penno J, Smith C, Lobb C, Taylor RW. Gender differences in sleep hygiene practices and sleep quality in New Zealand adolescents aged 15 to 17 years. *Sleep Health.* 2017;3(2):77-83.
- 14. Hysing M, Pallesen S, Stormark KM, Lundervold AJ, Sivertsen B. Sleep patterns and insomnia among adolescents: a population-based study. *J Sleep Res.* 2013;22(5):549-556.
- 15. Morin CM, Jarrin DC. Epidemiology of insomnia: prevalence, course, risk factors, and public health burden. *Sleep Med Clin.* 2022;17(2):173-191.
- Caldwell B, Redeker N. Sleep and trauma: an overview. *Issues Ment Health Nurs*. 2005;26(7):721-738.
- 17. Noll JG, Trickett PK, Susman EJ, Putnam FW. Sleep disturbances and childhood sexual abuse. *J Pediatr Psychol.* 2006;31(5):469-480.
- Belleville G, Dubé-Frenette M, Rousseau A. Sleep disturbances and nightmares in victims of sexual abuse with post-traumatic stress disorder: an analysis of abuse-related characteristics. *Eur J Psychotraumatol.* 2019;10(1):1-6.

- Charuvastra A, Cloitre M. Safe enough to sleep: sleep disruptions associated with trauma, posttraumatic stress, and anxiety in children and adolescents. *Child Adolesc Psychiatr Clin N Am.* 2009;18(4):877-891.
- 20. Langevin R, Hébert M, Bergeron SJ, et al. Sleep problems and interpersonal violence in youth in care under the Quebec child welfare society. *Sleep Med.* 2018;56(2019):52-56.
- 21. Mignot S, Fritel X, Loreal M, et al. Identifying teenage sexual abuse victims by questions on their daily lives. *Child Abuse Negl.* 2018;85:127-136.
- 22. Keeshin BR, Strawn JR, Out D, Granger DA, Putnam FW. Elevated salivary alpha amylase in adolescent sexual abuse survivors with posttraumatic stress disorder symptoms. *J Child Adolesc Psychopharmacol.* 2015;25(4):344-350.
- 23. Buysse DJ. Sleep health: can we define it? Does it matter? *Sleep.* 2014;37(1):9-17.
- 24. Gamache P, Hamel D, Blaser C. Material and social deprivation index : a summary : overview of the methodology. Institut national de santé publique du Québec website. <u>http://collections.banq.qc.ca/ark:/52327/4047517</u>. 2019; Accessed May 18, 2023.
- 25. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index (PSQI): a new instrument for psychiatric research and practice. *Psychiatry Res.* 1989;28(2):193-213.
- 26. Blais F, Gendron L, Mimeault V, Morin CM. Évaluation de l'insomnie: validation de trois questionnaires. L'Encéphale. 1997;23(6):447-453.
- 27. Raniti MB, Waloszek JM, Schwartz O, Allen NB, Trinder J. Factor structure and psychometric properties of the Pittsburgh Sleep Quality Index in community-based adolescents. *Sleep*. 2018;41(6):1-12.

- 28. Xiao D, Wang T, Huang Y, et al. Gender differences in the associations between types of childhood maltreatment and sleep disturbance among Chinese adolescents. *J Affect Disord*. 2020;265:595-602.
- Demirci E. Non suicidal self-injury, emotional eating and insomnia after child sexual abuse: are those symptoms related to emotion regulation? *J Forensic Leg Med*. 2018;53:17-21.
- 30. Dubois-Comtois K, Cyr C, Pennestri M-H, Godbout R. Poor quality of sleep in foster children relates to maltreatment and placement conditions. *SAGE Open.* 2016;6(4):1-7.
- 31. Bicanic IAE, Postma RM, Sinnema G, et al. Salivary cortisol and dehydroepiandrosterone sulfate in adolescent rape victims with post traumatic stress disorder. *Psychoneuroendocrinology*. 2013;38(3):408-415.
- 32. Turner S, Menzies C, Fortier J, et al. Child maltreatment and sleep problems among adolescents in Ontario: a cross sectional study. *Child Abuse Negl.* 2020;99:104309.
- 33. Sadeh A, Hayden RM, McGuire JP, Sachs H, Civita R. Somatic, cognitive and emotional characteristics of abused children in a psychiatric hospital. *Child Psychiatry Hum Dev*. 1994;24(3):191-200.
- Wamser-Nanney R, Chesher RE. Trauma characteristics and sleep impairment among trauma-exposed children. *Child Abuse Negl.* 2018;76:469-479.
- 35. Wells R, McCann J, Adams J, Voris J, Dahl B. (1997). A validational study of the structured interview of symptoms associated with sexual abuse (SASA) using three samples of sexually abused, allegedly abused, and nonabused boys. *Child Abuse Negl.* 1997;21(12):1159-1167.

- 36. Dressle RJ, Feige B, Spiegelhalder K, et al. HPA axis activity in patients with chronic insomnia: a systematic review and meta-analysis of case-control studies. *Sleep Med Rev.* 2022;62:101588.
- 37. Lanfranchi PA, Pennestri M-H, Fradette L, Dumont M, Morin CM, Montplaisir J. Nighttime blood pressure in normotensive subjects with chronic insomnia: implications for cardiovascular risk. *Sleep.* 2009;32(6):760-766.
- 38. Riemann D, Spiegelhalder K, Feige B. The hyperarousal model of insomnia: a review of the concept and its evidence. *Sleep Med Rev.* 2010;14(1):19-31.
- Babson KA, Feldner MT. Temporal relations between sleep problems and both traumatic event exposure and PTSD: a critical review of the empirical literature. *J Anxiety Disord*. 2010;24(1):1-15.
- 40. van Wyk M, Thomas KGF, Solms M, Lipinska G. Prominence of hyperarousal symptoms explains variability of sleep disruption in posttraumatic stress disorder. *Psychol Trauma*. 2016;8(6):688-696.
- 41. Werner GG, Riemann D, Ehring T. Fear of sleep and trauma-induced insomnia: a review and conceptual model. *Sleep Med Rev.* 2021;55:101383.
- 42. Neutel CI, Patten SB. Sleep medication use in Canadian seniors. *Can J Clin Pharmacol*. 2009;16(3):443-452.
- 43. Sandlund C, Westman J, Hetta J. Factors associated with self-reported need for treatment of sleeping difficulties: a survey of the general Swedish population. *Sleep Med.* 2016;22:65-74.

- 44. Rios P, Cardoso R, Morra D, et al. Comparative effectiveness and safety of pharmacological and non-pharmacological interventions for insomnia: an overview of reviews. *Syst Rev.* 2019;8(1):281.
- 45. Carskadon MA. Sleep in adolescents: the perfect storm. *Pediatr Clin North Am.* 2011;58(3):637-647.
- 46. Barth J, Bermetz L, Heim E, Trelle S, Tonia T. The current prevalence of child sexual abuse worldwide: a systematic review and meta-analysis. *Int J Public Health.* 2013;58(3):469-483.
- 47. Hébert M, Tourigny M, Cyr M, McDuff P, Joly J. Prevalence of childhood sexual abuse and timing of disclosure in a representative sample of adults from Quebec. *Can J Psychiatry*. 2009;54(9):631-636
- 48. Palmer JE, Fissel ER, Hoxmeier J, Williams E. #MeToo for whom? Sexual assault disclosures before and after #MeToo. Am J Crim Justice. 2021;46(1):68-106.
- 49. Dewald-Kaufmann J, de Bruin E, Michael G. Cognitive behavioral therapy for insomnia (CBT-i) in school-aged children and adolescents. *Sleep Med Clin.* 2019;14(2):155-165.
- 50. Crowley SJ, Wolfson AR, Tarokh L, Carskadon MA. An update on adolescent sleep: new evidence informing the perfect storm model. *J Adolesc*. 2018;67(1):55-65.