Title: School-Based Sleep Health Education In Canada

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ABSTRACT

Background & Objective. Canadian Ministries of Health and Education across all provinces aim to support and maximize the mental and physical health of students to ensure their ability to fulfill their academic potential. Chronic sleep loss affects all of these domains. However, tools to optimize youth sleep are generally lacking.

Methods. This manuscript explains the rationale for the integration of sleep health education into schools, describes the barriers to sleep health education, outlines efforts made to address them in Canada, and discusses future directions for sleep health education in Canada.

Results. There is unequivocal evidence that sleep plays critical roles in achieving the key goals to which Canadian schools are committed. Sleep restriction and poor sleep habits resulting from hectic, demanding, unbalanced lifestyles; pressure for academic success; participation in extracurricular activities; and the low priority given to sleep over competing activities are prevalent in Canadian youth of all ages and may significantly impair their learning, well-being, and health. Attempts to integrate sleep health education into school curricula meet with multiple barriers. Some of these barriers can be overcome by using community-based participation to develop and implement school-based sleep health education programs.

Conclusion. Successful school-based sleep health promotion programs hold the promise of having a long-lasting positive impact on students' physical and mental health, academic performance and daytime functioning.

Abbreviations: None

Key Words: School; Sleep Health; School-Based; Education ; Canada

School Based Sleep Health Education In Canada

Background

Canadian Ministries of Health and Education across all Canadian provinces aim to support and maximize the mental and physical health of Canadian students to ensure their ability to fulfill their academic potential. Mounting evidence indicates that adequate sleep has beneficial effects on health, learning, memory, attention, emotional regulation, and academic success. Conversely, fatigue and insufficient/inadequate sleep can negatively affect health, academic performance, self-regulation, and attention, all of which are necessary for success in school. Chronic sleep loss, which has been called one of the common plagues of modern society [1], affects a large proportion of youth across the world, including in Canada [2-3]. Studies conducted in Canada have shown that children of all ages do not get adequate sleep. Given the negative impact of inadequate sleep on academic performance [4-6], mental health, and physical health [7], it seems that sleep optimization should be prioritized by education ministries and school boards as a means to improve the academic performance, mental health, and physical health of students. Such intervention is expected to have an important positive impact because it would offer an accessible, inexpensive, non-pharmacological means for promoting the mental and physical health as well as learning capacity of Canadian youth.

Despite the pervasiveness and magnitude of sleep deprivation and poor sleep habits in Canadian youth and the consistency between the missions of the Canadian Ministries of Education and the benefits of healthy sleep, appreciation of the importance of sleep and the prioritization of sleep health as a part of school health curricula vary across the Canadian provinces. Furthermore, the tools to support the behavioral changes needed to optimize sleep are generally lacking. This is a problem because in the absence of such tools, many individuals may fail to fulfill their academic potential and to maintain their emotional and physical health. The *objectives of this manuscript* are: 1) to explain the rationale for integrating sleep education within schools; 2) to describe the barriers to sleep health education and the

efforts made to address them in Canada; and 3) to identify and discuss future directions in sleep health education in Canada.

The Rationale For Integrating Sleep Education Within Schools

Since 1905, thousands of studies have examined the associations between sleep and an array of key cognitive, emotional, and physical processes that are essential for the optimal academic performance [e.g., 8-10], mental health [11], and physical health of youth [7,12]. These studies have provided scientific evidence showing that sleep plays critical roles in the optimal execution of learning, memory, executive functions, sustained attention, emotional regulation, and mood regulation [13-18], all of which are essential for academic success, adjustment, and mental health. This is because neural areas that govern emotional regulation and executive functions are sensitive to sleep deficiency [19-26]. The connection between sleep and academic performance also manifests itself with regards to report card grades. For example, a comparison between school performance measures and reported total sleep time found that students who had grades of C, D, or F averaged 25-30 min less sleep per weeknight than did their peers with better grades [27]. In addition, sleep efficiency has been found to be associated with report card grades in Math, English, and French among Canadian students [28]. In terms of physical health, sleep is essential for restoring the body at the cellular level, and sleep optimization leads to improvements in metabolism, appetite regulation, and functions of the cardiovascular system, endothelial cells, and the immune system. Sleep deficiency is associated with increases in blood pressure and the incidence, progression, and severity of cardiovascular disease, diabetes, obesity, cancer, metabolic syndrome, and neuroendocrine abnormalities. Collectively, these studies provide unequivocal evidence that sleep plays critical roles in achieving the key goals to which Canadian schools are committed: maximizing the academic success, mental health, and physical health of their students.

Sleep restriction and poor sleep habits resulting from hectic, demanding, unbalanced lifestyles, pressure for academic success, participation in extracurricular activities, and the low priority given to sleep over competing activities are prevalent in Canadian youth of all ages and may significantly impair their learning, well-being, and health.

Several recent large-scale studies examining the sleep duration of Canadian youth found that 51% to 69% of students met sleep duration recommendations, and that 60% reported feeling tired in the morning [29]. Collectively, these findings suggest that one third to one half of Canadian youth does not get the recommended amount of sleep that would be needed for optimal academic performance or physical, emotional, and mental health. A statement issued by the American Academy of Pediatrics urged middle and high schools to aim for school start times of 8:30 a.m. or later, as it is thought that this will allow students to receive 8.5 to 9.5 hours of sleep per night [30]. Gariepy et al. examined school start time in Canadian schools, as reported by 29,635 students aged 10-18 years. They found that the mean school start time was 8:43 a.m. (SD: 0:17) and ranged from 7:57 to 9:37 a.m. [29]. Combining this with other findings, we see that although most Canadian high schools start around the recommended ~~sleep~~ (remove the word sleep?) start time (8:30 a.m.), a large number of Canadian students still do not get enough sleep. This suggests that sleep health should be incorporated into the health curricula of our schools.

The evidence indicates that it is possible to increase sleep duration and improve sleep habits, and that sleep extension leads to improvement in daytime functioning [31-33]. In typically developing school-age children and adolescents, sleep extension has been associated with improvements in performance on tasks measuring reaction-time, executive functions, memory and sustained attention and with detectable improvement in Conners' Global Index–derived emotional lability and restless-impulsive behavior scores of children in school [34]. These findings are important because they suggest that moderate changes in sleep duration can have detectable effects on the academic success and the behavior of youth.

Hence, extending and improving sleep could be an effective means to maximize the ability of our youth to fulfil their academic potential and improve their self-regulation.

The integration of sleep promotion programs into school curricula has been proposed as a way to improve youth sleep health and the related cognitive, physical, and emotional outcomes. Among young people, such programs are expected to increase knowledge regarding the importance of sleep and to significantly improve sleep health and related outcomes, including mental health and academic performance. Schools have been identified as an ideal formalized setting for health promotion programs because they can reach large segments of the youth population, provide a platform for health education and promotion [35], and actively encourage children to adopt and maintain a healthy lifestyle. In addition, it has been shown that using the existing infrastructure of the educational system can be a cost-effective route for delivering health promotion programs. Studies in other areas, such as obesity prevention and healthy eating, have shown that if school administrators and teachers are open to integrating school-based health promotion programs into existing school curricula, then the use of such curricula has the potential to become an acceptable and feasible method for reaching youth. It must be acknowledged, however, that integrating sleep health curricula within existing school curricula is not without its challenges [36].

Our group has encountered multiple barriers as we have attempted to develop school-based sleep education programs in Quebec. These barriers are commonly found when groups attempt to integrate sleep health education into school curricula. In the following section, we describe the potential barriers to developing and implementing school-based sleep health education programs and the ways in which our use of community-based participatory research has allowed our group to overcome many of these challenges to successfully develop effective school-based sleep health interventions.

Barriers To The Development And Implementation Of School-Based Sleep Health Education Programs

The pediatric sleep researchers who seek to develop school-based sleep health education programs usually have an excellent understanding of sleep processes and their relevance to academic performance and health. They also typically have the ability to measure sleep and related outcomes and are committed to improving the sleep health of students. However, they frequently lack a sufficient understanding of the organizational culture and the environmental context and resources of the schools into which they wish to integrate their interventions. This is a problem because the organizational culture influences the likelihood that a new intervention will be well-received and/or sustained by the school educators and administrators. Thus, even a well-developed and relevant intervention might not be accepted by the target schools.

Researchers also often lack expertise related to effective instructional practices at the target school level, impacting their ability to deliver their programs and/or train educators on how to deliver programs. Lack of training in curriculum design poses another challenge. It is helpful if the materials for sleep health education complement the existing school curriculum, enabling them to be incorporated into existing lesson plans. To allow this, the developed lessons should meet local (e.g., province-wide) curricular requirements and criteria. Researchers who lack the knowledge and skills needed to create or modify curricula that comply with local (province-wide) requirements are at a significant disadvantage.

Although sleep researchers understand that local circumstances (e.g., a child's living conditions, the availability of basic resources such as bedding, noise levels) directly affect sleep [37], these aspects are rarely considered during the design of a school-based sleep education program. This gap could result in programs that are perceived as irrelevant or not practical, diminishing their applicability/acceptance and decreasing the likelihood that students and their families will adhere to the intervention [38, 39].

Another set of challenges is related to the realities faced by schools and educators. Time pressure represents a significant barrier to the ability of staff to engage in disseminating preventative information pertaining to healthy sleep. Busy educators simply do not have an adequate opportunity to acquire novel relevant information or deliver that information to their students (~~classrooms~~). In addition, most educators have not been adequately trained regarding the importance of sleep, the impact of insufficient sleep, or the appropriate interventions that can help improve the sleep health of students. As a result, they may lack both awareness and knowledge of how sleep impacts several critical domains related to academic performance, and not have the tools to help students and families ~~to~~ make healthy sleep a part of daily life.

Another related obstacle concerns barrier the fact that there are an ever increasing number of health domains that are perceived as essential for student success and wellbeing. In many jurisdictions in Canada, the importance of student health and wellbeing has been acknowledged, but a comprehensive approach to promoting and teaching physical and mental wellness as ingredients to student success is lacking in many provinces. Whereas addressing each of these domains is ideal and desired, it might not be feasible in the absence of designated curricular time for such activity.

An additional barrier to the implementation of sleep health programs in schools is the issue of professional boundaries and scope of practice. Whereas all educators and school personnel share the mission of improving student wellness and academic success, they each have their own roles. Teachers frequently see their main goal as teaching, and may view issues such as improvement of sleep health as being the responsibility of other members of the school team. This could hinder the integration of sleep health education into regular teaching time. Some schools may consider health promotion as being part of physical education, other schools may expect a health professional (e.g., school nurse or psychologist)

to do this job, while yet other schools may not have a designated team member for such a role. Hence, educators who do not view health promotion as part of their professional duties may, while being very supportive of the overall idea, feel uncomfortable about getting involved or may see it as beyond the scope of their professional duties.

In light of these multiple barriers and challenges, it is not surprising that there are relatively few published school-based sleep education programs worldwide. Moreover, most the programs that have been developed have not proven effective in improving the sleep health of students (for detailed reviews see ref. 36, 40-42).

It is thus critical that sleep researchers address the barriers that limit the development of effective school-based sleep health education and fill existing gaps in the knowledge base. Toward this end, our coalition of researchers and school-board partners in Quebec has used, for the first (and only) time, community-based participatory research to co-create theory-driven school-based sleep programs. In the next section, we describe how this approach allowed us to successfully address a number of the practical and policy-related barriers mentioned above. We expect this information to be useful to other groups who might be facing some of these challenges.

Case Study: Successful Sleep Health Education In Canada

Community-based participatory research refers to a process in which stakeholders or potential knowledge users are engaged throughout the entire research process. Researchers and research users shape the process by collaborating to determine the research questions, decide on the methodology, share expertise, collect data, develop tools, interpret the findings, and disseminate the results. This process produces research findings that are relevant to and applied by the end users [43-45].

Our Quebec-based partnership, which has been engaged in community-based participatory research since 2007, includes the Riverside School Board (RSB), the Lester B Pearson School Board, and the Attention, Behaviour, and Sleep (ABS) Lab at McGill University/Douglas Research Center in Montreal. The partners comprise the main stakeholders in these school boards, including school principals, teachers, parents, school psychologists/mental health workers, physical education experts, key administrators of each school board, and representatives of the involved schools. The long-term goal of our partnership is to promote the health and learning capacity of students by extending and improving their sleep. The specific objective is to develop a means to apply the knowledge gained from research regarding sleep and its positive impact on the health and learning capacity of young persons. The guiding principles of our partnership include the following: 1) equal participation by all community and academic partners in all activities; 2) recognition that all partners have useful expertise; and 3) recognition that community-based research is collaborative. Our adherence to these guiding principles has allowed our partnership to comfortably and effectively benefit from highly complementary areas of expertise and experience, as is detailed below, while ensuring our access to the physical and administrative infrastructure and equipment needed to achieve our goals.

The educational leaders in our partnership include: **Somerville**, who is the former director of complementary services at RSB and its current research advisor; **Scroggins**, who is the current director of complementary services at RSB; **Racette**, who is the Director General of RSB and has been an educational leader in Quebec for over 20 years; and **Finn**, who is the current director of student services at Lester B. Pearson School Board. Each has created and integrated several clinical service platforms in their respective school boards. **Somerville** hold a Master's degree in Education, Administration and Policy as well as a certificate in Special Education, and has over 20 years of experience in the education sphere. As the current research advisor of RSB, she is overseeing the use of participatory research and its integration into RSB schools, forging strong connections between researchers and members of the

community that result in effective outcomes. As a co-PI on three of our CIHR-funded grants, she has co-pioneered the use of community-based participatory research to develop and integrate school-based sleep promotion program in RSB schools. Together, we co-created two innovative school-based programs, *Sleep for Success* and *Healthy Nights and Healthy Days*, which promote the adoption of healthy habits to promote overall physical well-being, mental well-being, and academic success. **Finn** holds a PhD in educational psychology and worked as a school psychologist before taking on administrative duties. She has held several leadership positions alongside other administrators in Quebec school boards. As former chair of the Administrators of Complementary Educational Services and the Leadership Committee for English Education in Quebec, a past member of the Advisory Board on English Education, and past president of the Canadian Association of School System Administrators (CASSA), she has contributed to creating policies aimed at maximizing the access and quality of services for students with educational needs in Quebec. In addition, she was instrumental in establishing the Centre of Excellence for Mental Health at Lester B. Pearson which supports all 10 English School Boards in Quebec for which she won the 2017 Outstanding Achievement Award bestowed by the Association of Administrators of English Schools of Quebec. **Somerville** and **Finn** have extensive experience in implementing school-based interventions, as each has created and integrated various service delivery models in their respective school boards. Our collaboration also includes **Boursier**, who is a teacher with extensive experience in developing educational materials, and who is leading our lesson-development efforts. Over the years, we have benefited from the contributions of numerous school principals, teachers, special education experts, physical activity leaders, parents, and students. Last, our partnership includes internationally renowned pediatric sleep experts (**Brouillette, Gruber, Wise**) who have extensive experience in addressing sleep issues in pediatric populations, along with various trainees in sleep and education.

A principle of community-based participatory research is that co-learning and co-teaching should be encouraged between the community and academic partners. By following this principle, we have created

a unique capacity to integrate the expertise of our community partners in all relevant domains of education, along with the expertise of the researchers and sleep clinicians in sleep and in all aspects of quantitative and qualitative research, and clinical sleep medicine. The involvement of an experienced team of educators has provided us with the means to address various issues we have identified as being problems elsewhere, such as a lack of an understanding of the educational system, a lack of expertise in effective teaching methods, and a lack of training in curriculum design. The team of educators helped us create programs that comply with the requirements of the Quebec Ministry of Education to adapt for students' diverse learning styles and strategies, the development of critical and creative thought, and the development of cross-curricular competencies while fully meeting the developmental needs of the children. The sleep experts identified essential sleep content and interventions, and our team of educators designed activities that relayed this knowledge to students in ways that were meaningful and motivational for them. Specifically, the educators chose to use an experiential learning approach, which is an educational approach that provides students with competencies needed for real-world success by addressing real-world problems and situations through teacher-directed and facilitated learning [46]. The classroom materials were not lecture-based, but rather consisted of group projects and activities that allowed students to develop their own ideas, integrate concepts highlighted in the program materials, and discuss the importance of their habits with peers. To allow teachers to integrate the program activities into their regular teaching activities, rather than requiring them to add additional teaching time for program implementation, the partnership designed each program activity so that it could be used to teach skills required by the Ministry of Education of Quebec.

To develop familiarity with the local circumstances and make an effort to adapt the program to the needs, cultural characteristics, and preferences of our community partners, the partnership, led by the academic partners, conducted a pre-intervention scan to determine the amount of sleep students obtain, their level of sleep knowledge, and the presence/absence of certain skills needed to implement proper

sleep hygiene. The health curricula of the target schools were assessed to determine whether sleep education appeared in any of the existing modules and, if so, what information was included. This information guided the educators, as they were able to prioritize the information deemed to be most relevant to their school board communities.

Our partner educators and school board members have benefited from the sleep team's knowledge and understanding regarding the importance of sleep, the impact of insufficient sleep, and interventions that may be used to improve students' sleep health. The educators have acquired awareness and knowledge regarding the impact of sleep on several critical domains related to academic performance, and now appreciate the need to help students and families make healthy sleep a part of daily life. This helped them see where they could integrate the necessary knowledge into the program. Once the program was finalized, the research team produced and prepared all of the necessary materials and the school board allocated release time for teachers to be trained on the final version of the program. This strategy meant that the busy teachers did not have to spend time preparing materials. Also, since the program was developed to adhere to the Quebec curriculum requirements, the teachers did not have to add time to deliver the information to their students, but rather could use the material in their regular teaching time.

Collectively, using community-based participatory research to develop our sleep health interventions has enabled us to: 1) enhance the relevance and application of the research data to all partners involved; 2) integrate our expertise in sleep with our partners' educational skills, knowledge, and expertise; 3) enhance the quality, validity, sensitivity, and practicality of our research by involving the local knowledge of the participants; 4) examine the community's unique circumstances and make efforts to adapt best practices to its needs; and 5) overcome multiple barriers that have been found to limit the development and implementation of school-based sleep health education programs. We successfully developed school-based sleep health interventions tailored to the developmental and cultural

characteristics of our target populations. The use of community-based participatory research provided us with the means to successfully translate research findings into effective intervention that improved the sleep and academic performance of youth in the involved communities [46]. In addition, our work received the 2012 Canadian Psychological Award For Distinguished Contributions to Public or Community Service, and the Institut National de Santé Publique du Québec invited us to produce a document describing the importance of sleep for health and success. A section of this document was integrated into the Quebec Healthy Schools manual, in the hopes of promoting sleep education as an integral component of health.

Future Directions For School-Based Sleep Health Education In Canada

Local partnerships like ours are excellent structures for advocating for policy change a local level, for working to share resources, and for offering continued professional learning. However, advocating for the integration of sleep health education into school curricula is a greater challenge, as it rests in the hands of policy makers and school systems across the country. Moreover, addressing sleep health in the school setting is only just beginning to be widely accepted as an important prevention initiative. Although Public Health Canada has recognized sleep deprivation as a public health epidemic, sleep health has not yet been prioritized by the Canadian Ministries of Health and Education. Until such recognition occurs, it will be difficult to obtain the resources needed to support the development, integration, and sustainability of school-based sleep health programs, or to make schools receptive to the idea of adding such content into their current lesson plans, given their already busy schedules and existing priorities.

How Can We Effect Change In The Canadian School Systems?

This section seeks to suggest initial strategies for catalyzing change in the Canadian school system that will result in the prioritization of sleep health education into schools' strategic plans in order to promote healthy sleep to all Canadian youth.

Development Of Tools

Developing feasible evidence-based strategies to promote healthy sleep for youth through the school system. Although some progress has been made with regards to the development of evidence-based tools for sleep health promotion in Canadian schools, multiple gaps and needs remain. These include the integration of effective sleep health promotion into a broader curriculum, which would allow educators and students to focus on sleep as a priority while integrating it into other domains of life. Such initiatives would ideally be developed by coalitions of policy makers, educators, school administrators and sleep experts to maximize uptake and Canada-wide dissemination. In addition, the discourse on sleep health and related tools should be extended to all stages of development, ranging from preschools and daycare facilities to colleges and universities, and should ultimately lead to the development of healthy sleeping guidelines for these sectors.

Advocacy

Collaborate with national organizations seeking to optimize youth physical, mental, and cognitive health to raise awareness to the importance of sleep. We believe that the need to provide schools with effective tools to address the sleep health of students should be declared a critical priority by national organizations seeking to optimize the physical, mental, and cognitive health of Canadian youth, such as the Mental Health Commission of Canada's Youth Council [47], the Canadian Association of School System Administrators and school-based mental health organizations [48, 49].

Inform and Work With Educational Policy Makers. Efforts should be made to influence the integration of sleep health education into provincial and local educational policies. This could be facilitated by the preparation of policy briefs for government decision makers. Working with the Council of Ministers of Education Canada (CMEC), an intergovernmental body that brings officials from each of

the provincial/territorial ministries of education together to discuss policy issues and undertake projects, would be one avenue to explore. These briefs should include informed and critical analysis on academic, behavioral, emotional and physical issues that are affected by sleep, and on the short- and long-term benefits of improved sleep.

EMPOWERMENT OF EDUCATORS

Sleep-related information and skills should be incorporated into the training given to educators and school administrators, so that such knowledge can form part of their professional practice. This might be feasible through pre-service teacher training programs provided by universities or ongoing in-service professional development offered to teachers by school boards. Such training would provide interested certified teachers with knowledge, skills and tools to improve sleep health in students of all ages.

SUMMARY

This manuscript describes the rationale and potential benefits of integrating sleep health education into the school system, along with the challenges and potential solutions for achieving this goal. Although the old saying "*Early to Bed and Early to Rise Makes You Healthy, Wealthy, and Wise"* has been common wisdom for generations, this message is largely missing from modern curricula. Successful school-based sleep health promotion programs hold the promise of having long-lasting positive impacts on the physical and mental health of students, thus improving their academic performance and daytime functioning.

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