

“Sleep is healthy for your body and brain”: Use of student-centred photovoice to explore the translation of sleep promotion at school to sleep behaviour at home

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Study Objectives: Schools are an important setting to teach and reinforce positive health behaviours such as sleep, however, research that incorporates the student perspective of school-based sleep promotion initiatives is limited. This study explored student's perceptions of sleep behaviour (how they understood and valued positive and negative sleep behaviours) and determined if and how students translate school-based sleep promotion to the home.

Methods: 45 grade 4 and 5 children (aged 9-11 years) were purposefully sampled from three schools participating in the Alberta Project Promoting healthy Living for Everyone in schools (APPLE) in Edmonton, Canada. Using focused ethnography as the method and photovoice as a data generating strategy, qualitative in-depth information was generated through photo-taking and one-on-one interviews. Data were analyzed in an iterative, cyclical process using latent content analysis techniques.

Results: Four themes related to students' perception of sleep behaviour within the context of a school-based sleep promotion initiative were identified: sleep is "healthy for your body and brain," sleep habits are rooted in the home environment, school experiences shape positive sleep habits at home, and students translate sleep promotion home if they think it is useful or would be acceptable to the family.

Conclusion and implications: School-based sleep promotion interventions that are grounded in the comprehensive school health (CSH) approach hold promise for successfully shaping student sleep behaviour. To promote health and academic success in children, future interventions should include home-school partnerships that address child sleep across multiple critical learning environments.

Keywords: Comprehensive school health, student-centred, school-based sleep promotion, home environment, home school interaction, photovoice, school-based health promotion, qualitative

List of Abbreviations

APPLE: A Project Promoting healthy Living for Everyone in schools

CSH: Comprehensive School Health

1 **Background**

2 Adequate, quality sleep is required for healthy growth and development in
3 children with the majority of school-aged children requiring 9-11 hours of uninterrupted
4 sleep each night.^{1,2} However, approximately 30% of Canadian school-aged children are
5 not getting adequate sleep and may suffer adverse physical and psychosocial health
6 outcomes as a result.³ Inadequate sleep in children has been associated with childhood
7 obesity, insulin resistance, and hypertension.^{4,5} It has also been associated with
8 behavioural impairments such as daytime sleepiness, hyperactivity, impulsivity, memory,
9 and attention issues.^{6,7} Children with poor sleep may suffer additional health
10 consequences stemming from decreases in physical activity and unhealthy eating
11 behaviours.^{8,9} These physical and psychosocial outcomes are detrimental to children's
12 academic performance¹⁰⁻¹² and quality of life.¹³ Clearly, children's sleep is a public health
13 issue that requires intervention to prevent adverse health and academic outcomes.

14 It is well-known that multiple critical learning environments shape children's
15 sleep behaviour. Parent-child relationships, parenting practices, and role modelling
16 profoundly affect child sleep patterns throughout development, whereas neighbourhoods
17 and socioeconomic status (SES), school policy, and academic commitments influence
18 child sleep behaviour in differing ways.¹⁴ A "school learning community" promotes
19 collaboration across multiple learning environments, emphasizing the relationships
20 between educators, students, parents, and community partners as central to improving
21 children's health and academic achievement.¹⁵ Given that sleep is a behaviour that is
22 shaped by multiple environments, it is reasonable that investment in sleep promotion
23 initiatives should include both the school and home.

School-based health promotion interventions that are grounded within the comprehensive school health (CSH) approach are an increasingly favourable option to improve child health and academic outcomes.¹⁶⁻¹⁸ CSH is an internationally recognized approach that promotes student health and academic outcomes through four key components to build a healthy school community – 1) social and physical environment, 2) teaching and learning, 3) partnerships and services, and 4) healthy school policy. In Canada, the Pan-Canadian Joint Consortium for School Health was founded in 2005 to foster collaboration between health and education sectors and guides the implementation of CSH across Canada, and sleep education is currently integrated into learning outcomes within Alberta. Home-school collaboration is at the core of the CSH framework as partnerships between the home and school have proven more effective in promoting student academic outcomes than the school alone.^{19,20} Students have previously been identified as the bridge that links the school and home environments and may promote home-school communication by initiating health behaviour changes in the home.²¹ Surprisingly, there is minimal research on the effectiveness of school-based sleep promotion interventions that target school-aged children's sleep. While a variety of research on school-based sleep education programs in child populations ~5-13 years exists²²⁻²⁵, such interventions tend to focus on in-class educational components and behavioural change strategies, revealing a paucity of data on school-based sleep promotion interventions that utilize a whole-school approach. For the purposes of this paper, the term “school-based sleep promotion” will refer to interventions that implement CSH or a whole-school approach. A search of “school-based sleep promotion”, “comprehensive school health”, and “school-based health promotion” yielded only one

study in adolescents.²⁶ The overwhelming lack of evidence of school-based sleep promotion interventions that utilize the CSH approach underscores the need for additional data on sleep promotion in schools. As well, current evidence from sleep promotion interventions limited to school settings demonstrate minimal sustained behavioural change in children and adolescents, warranting a need for more nuanced study to determine effective interventions.^{25,26}

Schools can be useful settings to teach and reinforce positive sleep behaviours across a 24-hour span. Sleep education may include information on consistent bed/wake up times to ensure adequate sleep duration, having a bedtime routine, limiting digital devices/technology use, physical activity and healthy eating practices throughout the day, and promoting environments that are conducive to sleep (dark, quiet, comfortable, and cool). In addition to traditional educational approaches, healthy sleep practices may be reinforced in the school through positive conversations about sleep, consideration towards school policy (e.g., school start times), and health-focused partnerships and services. To the researcher's knowledge no research exists that assesses the effectiveness of school-based sleep promotion utilizing the CSH approach, emphasizing relationships between educators, students, parents, and community partners, however, it is promising that research that has incorporated the family and community has resulted in extended sleep duration and sleep efficiency in school-aged children.^{27,28} Methods to involve the family and community included: letters sent home to parents with suggested discussion topics, information sessions, parental involvement in homework activities, and staff workshops with information on child sleep.²⁸ Additional research is required to understand how interventions guided specifically by CSH affect child sleep behaviours.

Given that the student perspective is essential to the success of such initiatives, it was a key focus within this research. This study sought to examine student's perceptions of sleep behaviour (how they understood and valued positive and negative sleep behaviours) and to determine if and how they translate school-based sleep promotion to the home.

Methods

Methodology

This research was guided by qualitative inquiry.²⁹ Framed within a constructivist perspective, knowledge acquired from interactions between participants and researchers were viewed as products of mutual understanding and the result of a co-creation of knowledge. Focused ethnography was used to guide this research and is a targeted form of ethnography that seeks to understand a specific social or cultural setting. Focused ethnography has been successfully utilized in various applied health settings and has utility in school contexts^{21,30} and was paired with photovoice as data generating strategy to allow students to convey their knowledge and expertise through visual representation. This study was coordinated by a graduate student (School of Public Health) with the support and guidance of an experienced qualitative researcher with input from a research team with relevant expertise and knowledge fitting the research scope.

Setting: APPLE Schools

APPLE Schools is a school-focused health promotion initiative that exists in 75 elementary school communities in Alberta, Northwest Territories, Manitoba, and British Columbia and impacts the lives of 20,000 Canadian students annually. As an evidence-

based, innovative, and globally recognized health promotion intervention, APPLE Schools utilizes the CSH approach to create, support, and sustain healthy school communities. APPLE Schools serves vulnerable school communities across British Columbia, northern Alberta, Northwest Territories, and Manitoba. The three schools that participated in this research project were located in Edmonton, in Alberta, Canada. Schools were all K-6 Schools and student population ranged from 219-306 students in the 2018/2019 school year. APPLE Schools provides opportunities for sleep promotion such as monthly campaigns ‘Be A Sleep Star’, ‘Sweat, Step, Sleep, Sit’, and ‘Don’t be the Walking Dead’ that include daily announcements, interactive family-based games, parent newsletters, and in-class lessons.

Participants

Fifty-three Grade 4 and Grade 5 students were purposely sampled from two grade 4/5 split classrooms and one grade 5 classroom from three APPLE Schools within Edmonton, Canada. Schools were recruited in partnership with the APPLE Schools management team. Students in these grades were chosen as children approximately 9-11 years of age have the cognitive ability to explain concepts to the researcher, engage in operational thinking, and provide assent.³¹ All students received hard copy parent consent letters that were sent home by the school, and completed a student assent to participate in the study form. Written assent and consent was obtained by students and their parents, respectively. Ethical approval was granted by the University of Alberta Human Research Ethics Board [Pro00078831].

116 **Procedure**

117 To initiate the photovoice project, students participated in an in-class presentation
118 and brainstorming session led by the research team. Students partook in individual, small,
119 and large group work to conceptualize how the knowledge acquired through school
120 experiences may affect their sleep at home. All students had previously participated in the
121 school-based sleep promotion campaign ‘Be A Sleep Star’ which included classroom
122 lessons, interactive activities (e.g., bulletin board; brainstorming activities), daily
123 announcements, and parent newsletters. Students were asked to take photos of what ‘Be
124 A Sleep Star’ looked like at home, were given a 27-exposure disposable camera, and
125 shown how to operate the camera safely and directed to avoid taking photos of people.
126 Every student was reminded that they had control over what they decided to photograph.
127 Students were given 1 week to take photos and return cameras to their teacher, and were
128 scheduled for a one-on-one interview with a member of the research team. To avoid
129 feelings of exclusion, all students were included in the photo-taking activity and received
130 a copy of their photos, however, only students with parental consent were interviewed.

131 Aligned with the photovoice process, the purpose of the individual interview was
132 to select, contextualize, and codify their photos. First, students selected 5-6 photos that
133 best represented what ‘Be A Sleep Star’ looked like at home. . Second, students were
134 asked to contextualize these selected photos. Last, students codified all their photos by
135 categorizing their photos into groups and naming the groupings. Students were asked
136 questions relating to framing their photos (e.g., what do you see here, what is happening)
137 and questions relating their photos to school experiences (e.g., how does this relate to ‘Be
138 A Sleep Star’?). Nearing the end of the interview, time was given for students to speak

towards the meaning of all of their photos and students discussed contextual information on their sleep routine, home environment, and interactions with family members. Examples of these interview questions are: a) “what does your sleep routine look like” and b) “Is there anything else that you would like to add?”. Within 4 weeks of the initial interview, the research team returned to each classroom to conduct a member-check. Preliminary research findings were presented to each classroom in the form of a PowerPoint presentation and students provided feedback in a large group setting.

Data Analysis

Each interview was recorded and transcribed verbatim by a professional transcription service. Data were then imported into NVivo12 software and analyzed. Latent content analysis was used to identify meaningful units and describe student’s understanding of the translation of school learned sleep promotion to the home. Using data from student contextualization of 5-6 photos and initial coding of data with all their photos, transcripts were first read line by line to identify initial codes. Codes were then arranged to fit within categories, and these categories were reorganized and/or dissolved as new relationships were identified in the data. Last, overarching themes were established that provided a rich and descriptive account of student experiences. Four researchers conducted the interviews and one researcher completed the data analysis. To ensure consistency, peer debriefing occurred after each interview. Records of researcher reflections, feelings, ideas, and interpretations informed data analysis by providing context and allowing researcher reflexivity.

Results

Participant characteristics

A total of 45 grade 4 and grade 5 students participated in photo-taking and interviews. Of the 45 students (n=19 male, n=26 female), 10 were from School A, 18 were from School B, and 17 were from School C. The average age of students was 9.75 years (range 9-11 years) and most students (n=27) were in grade 5 (1 grade 5 class, 2 grade 4/5 split classes). 29 students attended their school since Kindergarten, 10 attended for the last 2-3 years, and 6 only attended within the last year. Living arrangements varied and students reported living in a house (n=26), townhouse/condo/duplex (n=15), or apartment (n=4). Out of the 45 students, 29 students had their own room and slept alone, while 16 slept in the same room as siblings (of which 8 slept in the same bed or a bunk bed). Students reported average wake-up times (6:45 am on weekdays, 8:15 am on weekends) and average bedtimes (8:30 pm on weekdays, 9:45 pm on weekends). Bedtimes were enforced by only mom (n=20), only dad (n=5), a combination of mom/dad (n=6), by grandparents or older siblings (n=8), and no enforced bedtime (n=6).

Four themes were identified: 1) sleep is “healthy for your body and brain,” 2) sleep habits are rooted in the home environment, 3) sleep-related experiences at school helped shape positive sleep habits at home, and 4) students translate sleep promotion home if they think it is useful to the family. Quotes have an assigned participant number, school letter, and relevant demographic information.

Theme 1. Sleep is “healthy for your body and brain”

Students perceived that sleep was healthy for the brain. Students explained that sleep was important for them to think clearly and process information, and helped with memory, focus, attention, and mood. One student indicated that if they did not sleep they would not be able to “think [and their] brain’s not going to be able to process” (P11, School A, Male, Age: 11, Grade: 5). The impact of sleep on memory, focus, and attention was often described as relating to feeling prepared for school and having energy to participate in class.

[Student] Yes because my teacher have taught – like another student brought up that if we don’t get like any sleep at all, we could possibly die or something like that, or it could affect our mood in school. Like if we don’t get enough sleep, we could be grumpy around others and maybe hurt their feelings. And I don’t want that to happen... The more you sleep it can heal your bones if they’re broken. And it keeps you healthy. And your brain and body to help you keep moving every day. (P51, School C, Female, Age: 10, Grade: 5)

Students described that sleep was healthy for their body. Students expressed that sleep was important for their body to grow and develop; one student described how sleep was important for them to avoid getting sick. Students recalled that if you did not sleep then you would not be able to grow or heal properly.

Theme 2. Sleep habits are rooted in the home environment

Students expressed that their sleep habits were rooted in experiences in the home. Students could easily recall their bedtime routine and described the consistency in their routine as they grew up. The majority of students indicated their parents set rules for them around bedtime and were involved in their bedtime routine (e.g., reading to them before bed), while others had more independence in determining activities before bed. One student discussed that her parent responded to her feeling afraid when trying to sleep and made her a dreamcatcher to help her feel safe:

[Insert Figure 1. My Dreamcatcher]

Cause I'm Metis so it's a part of my culture. And my mom made it so that – because I have nightmares, and it helps me sleep cause it – it's supposed to get rid of the nightmares and bring in dreams. So, I just took a picture cause it's one that my mom made, so it's memorable. I know that I'm safe because when I go to sleep (P5, School A, Female, Age: 9, Grade: 4). (Fig. 1)

Students also expressed that their sleep routine was influenced by what their parents or siblings were doing before bed. For example, if parents watched TV before bed, students would often watch as well.

[Insert Figure 2. The Shaper]

229

230

231 So this one is like a kind of bike and you like get it on and then you move your
 232 legs. But it doesn't go anywhere, and it also helps my legs and when I go to bed
 233 and stop moving them, they feel like relaxed and like all the energy is out when
 234 I'm done exercising. My – when my dad started doing it. Then I wanted to do it,
 235 and ever since then I've been doing it before bedtime. (P3, School A, Male, Age:
 236 10, Grade: 5). (Fig. 2)

237

238 **Subtheme 1: Technology use regulated in the home**

239 Technology use was strongly regulated by parental involvement. Although
 240 students were often aware of the negative effects on technology on their sleep, they
 241 would continue to use technology if permitted by their parents. Some students felt that
 242 using technology during their bedtime routine helped them to relax, and entertained them
 243 when they “had nothing else to do” (P27, School B, Female, Age: 10, Grade: 5). One
 244 student described his experience:

245

246

247 **[Insert Figure 3. I Have a TV That Helps Me Sleep]**

248

249

249 Because it helps me sleep kind of, in a way. If I have like nothing to do and I'm
 250 bored in my room and I can't sleep, I watch TV till I do...Say if you're tired like I

251 obviously could watch TV until you fall asleep, I guess. (P31, School B, Male,
 252 Age: 10, Grade: 5). (Fig. 3)

253

254 **Theme 3. Sleep-related experiences at school helped shape positive sleep habits at**
 255 **home**

256 Students described that their experiences at school helped them to build on their
 257 understanding of the importance of healthy sleep practices. ‘Be A Sleep Star’ was
 258 understood as “doing things that help you sleep” (P33, School C, Female, Age: 9, Grade:
 259 4) – students reflected on their current practices in their sleep routine and why these
 260 practices were important for their sleep. In particular, students discussed that school
 261 experiences helped them to reflect on embracing a healthy lifestyle. Students understood
 262 this healthy lifestyle as calming down before bed, being active, and choosing a healthy
 263 bedtime snack.

264

265 **Subtheme 1: Calming down**

266 Students recalled having learned to calm down before bed, but described that they
 267 learned in school about the importance of reading before bed as well. Students felt that
 268 they needed to calm down and relax before bed in order to have a good sleep and learned
 269 the importance of calming activities in school. Students recalled that journaling, making
 270 art, reading, and listening to music helped them to be mindful and calm, and would give
 271 them “nice dreams” (P20, School B, Male, Age: 10, Grade: 5).

272

[Insert Figure 4. A Soothing Song]

[Student] And the reason I took this, is because it soothes me. When I play the piano.

[Interviewer] Did you know, or did you think that maybe playing the piano affected your sleep at all, or no?

[Student] No not until I started to be very aware of what my sleep schedule was [from school]. Then it started to affect my sleep, in a good way. Yeah I practice more because my hands would probably get fidgety in my sleep. And when I play piano it usually drains [the energy] out. (P6, School A, Female, Age: 9, Grade: 4). (Fig. 4)

Subtheme 2: Being Active

Students remembered learning in school about the importance of physical activity to help them sleep . Physical activity was an important part of their sleep routine as it made them tired, worn out, and relaxed. One student described how physical activity is part of their lifestyle and they now understand how it affects their sleep:

[Insert Figure 5. Doing Exercise Before Bed]

Those are my shoes I wear when I go play badminton on Wednesday's and [I took this photo] because it's like getting exercise. So then I get tired and it seems to help me fall asleep faster. Same thing with swimming. Yeah [I learned from school that] doing exercise before you go to bed and you'd be more tired. (P4, School A, Female, Age: 10, Grade: 5). (Fig. 5)

Subtheme 3: Choosing a Healthy Bedtime Snack

Students recalled having a bedtime snack before bed since they were young, but learned about the importance of eating a healthy snack before bed from school recalling that "you can't really sleep, without enough food" (P15, School B, Female, Age: 10, Grade: 5). One student described why they had a healthy snack before bed and learning about it at school:

[Insert Figure 6. Bedtime Snack]

I think because it's good to have an apple before you go to bed because it has lots of vitamins and helps your body grow more, [and] because your body grows more by sleeping than being awake...I've been doing this since I learned [from school]. (P7, School A, Female, Age: 10, Grade: 5). (Fig. 6)

Theme 4. Students translate sleep promotion home if they think it is useful or would be acceptable to the family

While some students shared what they learned at school with their family, others chose not to. Some students expressed that they shared information about sleep at home to help their family have healthier sleep so that they could be more healthy overall, and also described why they chose not to share what they learned at school.

Subtheme 1: Wanting their family to be healthy

Several students identified unhealthy sleep practices in the home and were willing to share healthier sleep habits with their family. To improve family sleep behaviours, one student recommended that their family “read books before they go to bed instead of watching [the] TVs” (P23, School B, Female, Age: 10, Grade: 5). The awareness of healthy sleep practices helped students to translate and communicate these ideas home.

Subtheme 2: Choosing not to share

Students who did not share what they learned at school with their family often indicated that it was not relevant to their family. One student described that they chose not to share about the effect of technology on sleep with their family because their family did not use technology before bed. Other students discussed not sharing with family because they felt their family already had healthy sleep habits, or they felt their parents would not listen to them and make changes to their sleep routine. Students also felt that younger siblings who had sleep behaviours that were different from theirs would not benefit from their knowledge of healthy sleep habits. If students had older siblings they often felt that

their siblings would not listen to them, or that they were already practicing healthy sleep habits. One student recalled their experiences sharing with a family member:

With my brother cause usually he stays up on his phone till my mom goes to bed, so then he could go downstairs and watch TV. But then I told him he shouldn't do that because then you're not getting enough minutes/hours of sleep that you do need...And you should not go on the TV because that's just a bigger and brighter screen. Usually he doesn't really listen to me. (P30, School B, Female, Age: 10, Grade: 5)

Discussion

There is insufficient evidence to support school-based sleep interventions that only target individual behaviours and do not consider the wider influences of the school and home. For this reason, school-based sleep promotion initiatives that take a CSH approach may be more effective in addressing child sleep by cultivating home, school, and community partnerships. Recent research indicates that involving family, community, and school staff has promising results in altering student sleep behaviour.²⁸ Therefore, the CSH framework has potential to encourage students to make positive lifestyle changes in the home environment. Students have also been shown to drive changes in the lifestyle behaviours (e.g., healthy eating and physical activity) of family members and actively involve parents in their health decisions.²¹ The idea that students can bring information from the school to the home is well-established; however, what is novel is understanding how students initiate change in the home and involve their

families in this process. This concept has yet to be explored within the realm of school-based sleep promotion. Thus, the present study sought to examine student's perceptions of sleep behaviour (how they understood and valued positive and negative sleep behaviours) and to determine if and how they translate school-based sleep promotion to the home. Our findings demonstrated that students have knowledge of the importance of sleep and reflected on their current sleep practices in light of school experiences. The home environment strongly influenced the extent to which healthy sleep behaviours were carried out in the home.

In our study, we found that students were knowledgeable about the broad effects of sleep on their health and could explain the importance of sleep for attention, focus, school performance, mood, peer relationships, and physical development. Students attributed this knowledge to experiences both in school and at home. Due to the paucity of data in school-aged children, we can compare these findings with previous reviews of school-based sleep interventions in adolescents – most studies demonstrated improvements in sleep knowledge but little to no change in sleep behaviour, with few exceptions.^{25,26} We suggest that translating school-learned sleep behaviour to the home is subject to different barriers when compared to similar interventions with a focus on physical activity or healthy eating. It has been shown that role modelling is an important component of school-based health promotion interventions.³² However, healthy sleep behaviours cannot typically be directly modelled at school as common behavioural change strategies such as role modelling, and praise and reinforcement are most typically implemented in the home.³³ Our study provides a possible explanation for why sleep education programs have demonstrated little to no change in sleep behaviours. Indeed,

our study supports the need to move beyond the school to include the home environment. The findings of this study suggest that school-based sleep promotion initiatives using the Comprehensive school health approach may result in positive improvements in student knowledge of sleep and sleep behaviour.

Students expressed that they expanded their knowledge of sleep through their experiences with 'Be A Sleep Star'. Importantly, students attributed sleeping well to embracing a healthy lifestyle. Students described that it was important for them to calm down before bed and feel safe, comfortable, and secure; these findings are supported by other research where children described that they needed a comfortable bedroom and parental soothing to sleep well.³⁴ Students also described healthy eating and physical activity as an important part of their sleep, and we found that students understood the impact of such behaviours on their sleep. Emerging research emphasizes the importance of the entire movement continuum throughout the whole day.^{35,36} The Canadian 24-hour Movement Guidelines are grounded in a holistic perception of health and recognize the relationship between sleep, sedentary behaviour, and physical activity. This conceptualization aligns with findings from the present study as students described their sleep health in the relation to other health behaviours. Importantly, students in the present study may benefit from a more nuanced understanding of the impact of physical activity and sleep. For example, while increased daytime activity is thought to improve sleep outcomes, sleep onset is negatively impacted by physical activity too close to bedtime due to physiological responses.³⁷ Our results indicated that students understand physical activity as important for their sleep, however, students may not understand that physical activity too close to bed may make falling asleep more difficult.

Technology use at bedtime is pervasive in Canada, with well-established negative effects on children's sleep.^{38,39} In our study, students were knowledgeable about the effects of technology in keeping them awake and engaged. However, students frequently used technology at bedtime if permitted by their parents, regardless of their knowledge that technology had a negative effect on their sleep. This finding is consistent with previous literature describing that parents are strong mediators of their children's technology use in the home; children tend to use screens more often when they have fewer rules around electronics.^{40,41} In our study, students described that they primarily used technology before bed to avoid boredom and to help them relax, and indicated that they did not want to watch TV before bed because it could scare them or give them nightmares, headaches and eye strain. This finding is similar to a study completed by He et al.⁴¹ where children engaged in screen-related activities for entertainment, spending time with family, and to reduce boredom.

Strengths and Limitations

This research was limited by the timeframe of the project which may have resulted in recall errors by students. Students participated in the first researcher-led brainstorming activity approximately 2-3 weeks prior to their interview. Due to the length of time between the phototaking to the interview, students may have experienced recall errors in describing their photos. Students may have also been subject to desirability bias and varied their reporting of health behaviours and attitudes, as demonstrated in previous studies on self-reported diet and physical activity.⁴² Member-checks were performed in the classroom setting and students may have not felt comfortable speaking in front of

their peers and may have altered their responses or chose to not participate in group discussions. Due to limitations within photovoice methodology, students were unable to take photos on the absence of sleep behaviours, therefore students may be more likely to have taken photos of positive sleep events or behaviours. Lastly, we recognize that the researcher situated themselves within a westernized lens and promoted sleep practice guidelines that best suit a Eurocentric worldview. We recognize that children's sleep is shaped by various socio-political and environmental factors (e.g., socio-economic status, race/ethnicity, gender, cultural and family traditions) and the diverse cultural heterogeneity within the Canadian population results in varying perceptions of sleep that are not represented within this research project. Alternatively, this research demonstrates strength through qualitative inquiry into the lived experiences of students. Minimal amounts of school-based sleep promotion research exist to highlight the voice of school-aged students and qualitative research was required to address gaps in understanding the nuances of student sleep behaviour in the home. The findings of this research gave considerable depth and understanding into the translation of sleep promotion knowledge from the school to sleep behaviour in the home through the use of photovoice as a data generation strategy.

Conclusions and Implications

Our findings give direction for future school-based sleep promotion initiatives. As students described that their family played a vital role in shaping their sleep behaviours, it is recommended that future school-based sleep promotion initiatives incorporate learning resources that actively engage the whole family (e.g. interactive games/home sleep

challenges). By taking an additional step to involve parents, these activities may improve parent participation in such initiatives and may strengthen the utility of current school-based sleep promotion initiatives. Specifically, our study found that parents are key in regulating technology use in children. As such, learning resources that include a focus on child/parent technology use may be useful. Additional research is required to better understand teachers' perspectives of potential barriers to the implementation of school-based sleep promotion in schools. In addition, broad societal influences on sleep such as socioeconomic status, and neighbourhood qualities should be incorporated into future research on sleep promotion interventions. In sum, further research is warranted to build upon the strengths of the CSH approach with regards to children's sleep, and to investigate the effects of school-based sleep promotion interventions that are able to innovatively engage parents to promote sleep learnings beyond the school walls.

Declarations

Submission Declaration

This manuscript work has not been published previously and is not under consideration for publication elsewhere. This publication has been approved by all authors and if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

Ethics approval and consent to participate

Ethics approval was received from the University of Alberta Human Research Ethics Board (Pro00078831). Ethics approval to work with students in Edmonton Public Schools was received by the University of Alberta Faculty of Education Cooperative Activities Program. Written parental consent and written student assent was gathered from all study participants.

Consent for publication

All participants provided written consent for publication.

Availability of data and materials

The data used in the current study is available from the corresponding author on reasonable request and conditional HREB approval.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

The lead author (MB) coordinated the study with support and guidance from the core research team (KS, GM). CM, CB, JF, KN, and LS collaborated in project planning and development from the preliminary stages of the project and provided their expertise and input throughout the duration of the research. KS, GM, FS, and MB conducted the interviews. MB was the sole data analyst and wrote the manuscript with assistance from KS and GM. All authors read and approved the final manuscript.

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