

Later school start times for supporting the education, health, and well-being of high school students

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For the current issue of the *Journal*, we asked Dr. Kate E Storey to comment on and put into context the recent Cochrane Review on later school start times for supporting the education, health and well-being of high school students.

BACKGROUND

A number of school systems worldwide have proposed and implemented later school start times as a means of avoiding the potentially negative impacts that early morning schedules can have on adolescent students. Even mild sleep deprivation has been associated with significant health and educational concerns: increased risk for accidents and injuries, impaired learning, aggression, memory loss, poor self-esteem, and changes in metabolism. Although researchers have begun to explore the effects of delayed school start time, no one has conducted a rigorous review of evidence to determine whether later school start times support adolescent health, education, and well-being.

OBJECTIVES

We aimed to assess the effects of a later school start time for supporting health, education, and well-being in high school students. Secondary objectives were to explore possible differential effects of later school start times in student subgroups and in different types of schools; to identify implementation practices, contextual factors, and delivery modes associated with positive and negative effects of later start times; and to assess the effects of later school start times on the broader community (high school faculty and staff, neighbourhood, and families).

SEARCH METHODS

We conducted the main search for this review on October 28, 2014 and updated it on February 8, 2016. We searched CENTRAL as well as 17 key electronic databases (including MEDLINE, Embase, ERIC, PsycINFO, and Sociological Abstracts), current editions of relevant journals and organizational websites, trial registries, and Google Scholar.

SELECTION CRITERIA

We included any randomized controlled trials, controlled before-and-after studies, and interrupted time series studies with sufficient data points that pertained to students aged 13 to 19 years and that compared different school start times. Studies that reported either primary outcomes of interest (academic outcomes, amount or quality of sleep, mental health indicators, attendance, or alertness) or secondary outcomes (health behaviours, health and safety indicators, social outcomes, family outcomes, school outcomes, or community outcomes) were eligible.

DATA COLLECTION AND ANALYSIS

At least two review authors independently determined inclusion and exclusion decisions through screening titles, abstracts, and full-text reports. Two review authors independently extracted data for all eligible studies. We presented findings through a narrative synthesis across all studies. When two or more study samples provided sufficient information to permit effect size calculations, we conducted random-effects meta-analyses to synthesize effects across studies.

MAIN RESULTS

Our search located 17 eligible records reporting on 11 unique studies with 297,994 participants; the studies examined academic outcomes, amount and quality of sleep, mental health indicators, attendance, and student alertness. Overall, the quality of the body of evidence was very low, as we rated most studies as being at high or unclear risk of bias with respect to allocation, attrition, absence of randomization, and the collection of baseline data. Therefore, we cannot be confident about the effects of later school start times. Preliminary evidence from the included studies indicated a potential association between later school start times and academic and psychosocial outcomes, but quality and comparability of these data were low and often precluded quantitative synthesis. Four studies examined the association between later school start times and academic outcomes, reporting mixed results. Six studies examined effects on total amount of sleep and reported significant, positive relationships between later school start times and amount of sleep. One study provided information concerning mental health outcomes, reporting an association between decreased depressive symptoms and later school start times. There were mixed results for the association between later school start times and absenteeism. Three studies reported mixed results concerning the association between later school start times and student alertness. There was limited indication of potential adverse effects on logistics, as the qualitative portions of one study reported less interaction between parents and children, and another reported staffing and scheduling difficulties. Because of the insufficient evidence, we cannot draw firm conclusions concerning adverse effects at this time. It is important to note the limitations of this evidence, especially as randomized controlled trials and high-quality primary studies are difficult to conduct; school systems are often unwilling or unable to allow researchers the necessary control over scheduling and data collection. Moreover, this evidence does not speak to the process of implementing later school starts, as the included studies focused on reporting the effects rather than exploring the process.

AUTHORS' CONCLUSIONS

This systematic review on later school start times suggests several potential benefits for this intervention and points to the need for higher quality primary studies. However, as a result of the limited evidence base, we could not determine the effects of later school start times with any confidence.

The full text of the Cochrane Review is available in *The Cochrane Library*: Marx R, Tanner-Smith EE, Davison CM, et al. Later school start times for supporting the education, health, and well-being of high school students. Cochrane Database Syst Rev 2017, Issue 7. Art. No.: CD009467. doi:10.1002/14651858.CD009467.pub2.

EXPERT COMMENTARY: KATE E. STOREY PHD RD

Sleep is recognized as an essential component of a healthy lifestyle and is crucial to adolescent's physical and mental development. Longer sleep duration has been associated with better academic achievement, better emotional regulation, lower adiposity indicators, and better quality of life/well-being (1). Adolescents' sleep has been consistently declining in recent decades (2,3). Only 68% of Canadian adolescents met the sleep recommendation (4), and 36% of 14 to 17-year olds found it difficult to stay awake during the day (5). Insufficient sleep in adolescence is an important, timely, and remediable public health risk.

Reasons behind this 'sleepidemic' (6) are complex and inter-related and include biological, behavioural, and social factors. Considering biological contributors, adolescents tend to be 'late' chronotypes (7) and experience a sleep-wake 'phase delay' which manifests as later sleep onset and wake times of up to 2 hours in comparison to middle childhood. As a result, adolescents often have difficulty falling asleep before 23:00 and waking up before 08:00 (8). This circadian shift is at odds with early school start times. Consequently, most teenagers do not get enough sleep on school days. They then sleep-in on weekends in an effort to make-up for this sleep debt. This 'social jet-lag' (9) goes against recommendations for consistent bed and wake times (10), worsening circadian disruption, and increasing sleepiness in school.

Solutions which take a population health approach to 'stimulate' the general population to obtain healthy sleep (11) are required. One such solution is delaying secondary school start times to align with the adolescent sleep-wake cycle in addition to peak periods for adolescent neuropsychological performance, alertness, and learning. In 2014, the American Academy of Pediatrics issued a policy statement recommending middle and high schools aim for a start time of 08:30 or later (8), which aligns with the more recent position statement published by the American Academy of Sleep Medicine in 2018 (12). Several Canadian organizations have recently followed suit. However, more evidence is needed to examine the broad effects of later start times.

The results of the recent Cochrane review aimed to fill this knowledge gap. However, due to the limited and very low-quality evidence, the authors could not determine these effects (beneficial or adverse) with confidence. As well, there was a lack of standard intervention condition both in regards to the actual school start time and the number of minutes of the delay. The duration of exposure also varied. Most studies examined time shifts for a whole school year or semester, with exception of the randomized controlled trial, where exposure was only 1 week. However, even exposure of 1 year may not be enough time to observe significant changes. One promising finding was the significant positive association found from all studies (n=8)

that examined later school start times and amount and quality of sleep. The analysis revealed later start times were associated with greater school sleep duration on school days (mean difference 1.39 hours, 95% confidence interval 0.38 to 2.39). While deemed low-quality evidence, this provides an indicator that delaying school start times does not simply shift both bed and wake times.

Examining the included studies, I would argue more consideration needs to be given to the complex relationship sleep has with nutrition as well as behaviours along the movement continuum (i.e., physical activity, sedentary behaviour). These behaviours cluster and interact and the combined effects extend beyond their individual contributions (10). Only one study reported on these behavioural outcomes, which are essential to fully understand the impact of later start times. For example, by delaying start times, students may have more time to eat breakfast and may be less likely to consume caffeine, both of which have been shown to impact health and educational outcomes (13,14). Likewise, if students have more time in the morning, they may be more likely to actively travel to school (potentially with friends), thereby increasing not only their physical activity and social connectedness, but time spent outdoors conceivably exposed to sunlight (15). As many of the studies in the review were conducted over a decade ago, current screen time use is not reflected. The use of electronic devices has significantly increased and is frequently found in adolescents' bedrooms. Blue light emitted by screens can disrupt sleep, especially if used before bedtime, and screen time can displace other healthy behaviours and impact academic outcomes (16). Therefore, associations between technology, sleep, academic outcomes and other behaviours need to be more broadly considered. More consideration also needs to be given to potential unintended consequences such as decreased morning interactions between parents and children as cited by one study.

The evidence presented in the review spoke only to the effects and did not describe the process, a limitation identified by the authors. Understanding the process of implementation of school-based health promotion interventions, including delayed start times, is essential (17). Further, interventions should align with a whole school approach, such as comprehensive school health (18), to truly shift school culture to one that supports and promotes healthy sleep habits (17,19). Logistical factors such as staffing, transportation, extracurricular/social activities, student employment, childcare, and commuting were mentioned by three studies and should not be underestimated. As well, consideration of school community context (e.g., socioeconomic status, school type, policies), geographical location (e.g., climate, daylight, rural/urban), demands on students, and parental involvement in setting and monitoring bedtimes/sleep hygiene is critical. Novel strategies to support implementation of delayed start times have been cited and include: changing the

default option, promoting social norms, increasing the salience of messaging, and countering omission bias (20).

High-quality evidence is needed to inform policy and decision making to shift school start times, and also to understand if these approaches promote health equity. I echo the authors' conclusions that additional research is needed. While limited, this body of literature is growing and promising (21–23), including a recently published Canadian longitudinal study (24). Notably, there are challenges and limitations in conducting experimental and prospective studies with schools. Highly controlled studies often do not account for realities of implementing school-based interventions, and therefore we must also consider natural experiments (25) and different ways of knowing. Solution-oriented and strengths-based approaches (20), which consider school assets and needs, as opposed to focusing on deficits, are warranted and are more likely to be translated into practice. Community engagement, which must include youth voice (26), is paramount and should be prioritized to facilitate implementation. Ultimately, if school communities are supportive, later secondary school start times (even if minor) provide a solution-oriented approach to deal with the urgency and magnitude of adolescent sleep deprivation.

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