Original Manuscript

Association Between 24-Hour Movement Guideline and Physical, Verbal, and Relational Forms of Bullying Among Chinese Adolescents

Asia Pacific Journal of Public Health
2023, Vol. 35(2-3) 168–174

DOI: 10.1177/10105395221148851
journals.sagepub.com/home/aph

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Abstract

The Canadian 24-Hour Movement Guidelines for Children and Youth recommends specific guidance in physical activity, screen time, and sleep duration. The current research will further explore potential exposures between healthy movement and being involved in a bullying incident as a bully or a victim in a representative sample of adolescents in China. A total of 67821 Chinese students (response rate = 98.4%) were included in this study (mean age = 13.04 years). The results showed that meeting sleep recommendation only, meeting screen time recommendation only, and meeting both these two recommendations might be protective factors against being bullied or bullying others. Meeting moderate-to-vigorous physical activity (MVPA) recommendation only reported higher odds of being victims in all forms of bullying while meeting both MVPA and another combination of the guideline would relate to lower odds of being a bully and a bully-victim in all forms of bullying involvement.

Keywords

physical bullying, verbal bullying, relational bullying, Canadian 24-hour movement guidelines

What We Already Know

- Bullying involvement could lead to severe and even long-lasting health consequences.
- Healthy lifestyle could effectively reduce students from being the victim of bullying.
- Adopting a healthy lifestyle could prevent adolescents from becoming perpetrators of bullying.

What This Article Adds

- Meeting more recommendations was associated with lower odds of bullying involvement.
- Only meeting moderate-to-vigorous physical activity (MVPA) recommendations might be the risk factor for bullying involvement.
- Adolescents were encouraged to meet both MVPA and other healthy movement recommendations.

Introduction

Bullying has been in light in recent years, which refers to a specific form of aggressive behavior presenting the following characteristics: (1) intend to harm, (2) repetitive over time, and (3) involving a power differential between victims and perpetrators.[1] The victim in the bully event is the vulnerable party in the bullying situation, whereas the bully refers to the one who played the dominant and assertive role in the bullying accident. However, some bullies also coexist with victimized (called bully-victim), suggested by previous studies to be considered separately due to their uniqueness.[2] Previous research showed that all bullies, victims, and bully-victims could lead to severe and even long-lasting health consequences. For instance, victimization is confirmed as a unique predictor of depression[3] and numerous adjustment

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problems.[4] In addition, bully-victims are generally highly rejected by their peers and perform more externalizing and internalizing problems.[2] Accordingly, given its adverse consequences, research on bullying has essential societal and health relevance.

Early studies focused more on physical (eg, hitting) and verbal (e.g., name-calling) bullying, which was considered as a "male phenomenon." Recently, more subtle forms of bullying have been examined, such as relational bullying (exclusion and spreading rumors). These three forms of bullying are recognized as the most critical manifestations of bullying. Although there is a considerable overlap among physical, verbal, and relational bullying, previous studies implied that different types of bullying might exert the various degrees of negative influence, which invokes and distinguishes targeted prevention programs. For instance, physical bullying is the most visible and highly concerned form since it involves violence and physical harm. By contrast, although verbal bullying is not as pronounced as the physical one, it garners lots of attention in recent years as it was recognized as a trigger to physical bullying.[5] Moreover, relational bullying receives less attention because it is often considered less harmful or is discounted as a kind of normative behavior.[6] However, relational bullying is more strongly associated with emotional distress than physical and verbal bullying,[7] and also have been found to be a predictor of future maladjustment behavior and mental health problems.[1,8] Thus, a better understanding of the three types of bullying is needed to help develop more targeted prevention programs.

Previous research suggested that lifestyle behaviors can predict adolescents' bullying victimization.[9,10] Specifically, regular physical activity could effectively reduce students from being the perpetrator of bullying because it promotes their prosocial attitudes,[11] helps them develop positive peer relationships,[12] and prevents bullying victimization.[10,13] Sedentary behaviors (e.g., excessive screen time) were confirmed as risk factors in behavior problems, including bullying involvement among children and adolescents, as they are more exposed to media violence.[13,14] Adequate sleep duration could also be a protective factor as previous studies showed that students with inadequate sleep would perform more remarkable impulsive behavior.[15,16] While previous studies have shown benefits for the single lifestyle, the publication of the first 24-Hour Exercise Guidelines for Children and Adolescents in 2016 represents a major shift to consider how these three movement behaviors (ie, physical activity, screen time, and sleep duration) are co-dependent in reducing bullying involvement among adolescents.[17] According to Canadian 24-hour Movement Guidelines for Children and Youth (5-17 years), 60 minutes of moderate-to-vigorous physical activity (MVPA) per day, 9- to 11-hour sleep duration for those aged 5 to 13 years and 8 to 10 hours for 14 to 17 years, and no more than 2 hours of recreational screen time per day were recommended for children and adolescents.[17] To date, only one study explored whether meeting the guidelines of physical activities, sleep duration, and screen time could reduce bullying involvement among Canadian students.[9] Sampasa-Kanyinga et al[9] found that meeting all three recommendations of physical activities, screen time, and sleep time were strongly associated (i.e., lowest risk) with being a victim of school bullying and a bully-victim or a victim of cyberbullying. Nevertheless, bullying in this study was only distinguished as school bullying and cyberbullying, which ignores the different influences of healthy behavior movement on different types of bullying (ie, relational bullying, physical bullying, and verbal bullying). In addition, direct empirical research on the relationship between combinations and different types of bullying and healthy behaviors in Chinese population is still scarce. Therefore, more studies need to move beyond the exclusive focus on a single movement behavior to the collective behaviors in reducing bullying, which is more inspirational for developing targeted anti-bullying interventions.

Overall, the current research will further explore potential exposures between healthy movement and being involved in a bullying incident as a bully or a victim in a representative sample of adolescents in China.

Methods

Procedure and Participants

Participants completed the anonymous online questionnaire in the computer room of their school between March 1 and March 25, 2021. A total of 79 664 participants were recruited in this survey, and 78 428 of them completed it (response rate = 98.4%). Finally, 67 821 students (mean age = 13.04) who were drawn from six grades, 135 schools, and nine districts were included in this study after deleting invalid questionnaires (valid rate: 84.5%). The descriptive characteristics of demographic are shown in Supplementary Table 1. This survey study was approved by Shenzhen University Research Board (No. 2020005) and permission to conduct the study was obtained from the teachers and principals at the participating schools. Multi-stage sampling design was conducted in this study. All participants and their parents or guardians provided signed consent.

Measure

24-hour movement guideline. The 24-hour movement guideline was assessed by three aspects, including physical activity, screen time, and sleep duration according to Canadian 24-Hour Movement Guidelines. Physical activity was assessed by the item "how many days did you participate in moderate-to-vigorous physical activity for at least 60 minutes each day during the past seven days?" Responses to this item ranged from "0" to "7." Participants who responded "7" met the physical activity standard, while those who answered "6" or less did not.[17] Chinese version of this measurement shows good reliability

Table 1. Association Between General and Specific Combination of Movement Behavior Recommendations and Physical Bullying.

	Physical victim		Physical bully		Physical bully-victim	
	OR	95% CI	OR	95% CI	OR	95% CI
Specific combinations						
All	0.64***	[0.53, 0.76]	0.35***	[0.23, 0.53]	0.33***	[0.19, 0.55]
Screen + MVPA	0.95	[0.84, 1.06]	0.71**	[0.57, 0.89]	0.72**	[0.56, 0.94]
Sleep + MVPA	0.86	[0.68, 1.07]	0.66*	[0.43, 1.00]	0.67	[0.41, 1.11]
Sleep + Screen	0.62***	[0.57, 0.68]	0.43***	[0.36, 0.51]	0.41***	[0.33, 0.52]
MVPA only	1.21**	[1.06, 1.32]	1.18	[0.95, 1.47]	1.16	[0.90, 1.51]
Screen only	0.78***	[0.73, 0.82]	0.55***	[0.49, 0.61]	0.55***	[0.48, 0.63]
Sleep only	0.79***	[0.72, 0.76]	0.71***	[0.60, 0.85]	0.75**	[0.62, 0.92]
None (ref)	—	—	—	—	—	—
General combinations						
Three	0.64***	[0.53, 0.76]	0.34***	[0.23, 0.53]	0.19***	[0.19, 0.55]
Two	0.72***	[0.67, 0.77]	0.51***	[0.45, 0.59]	0.43***	[0.43, 0.61]
One	0.80***	[0.76, 0.85]	0.62***	[0.56, 0.68]	0.56***	[0.56, 0.71]
None (ref)	—	—	—	—	—	—

Abbreviations: MVPA, moderate-to-vigorous physical activity; OR, odds ratio.
*$P < .05$. **$P < .01$. ***$P < .001$.

among Chinese population in previous studies.[18] Daily screen time was calculated by the following formula: [sum (weekday screen time) × 5 + sum (weekend screen time) × 2]/7. Participants who responded no more than 2 hours/day of screen time were recognized to meet the screen time guideline standard, while students who responded to other potions did not.[17] Sleep duration was accessed by the following item from Pittsburgh Sleep Quality Index (PSQI): "In the past month, how long do you usually sleep every night (the time you actually fell asleep)?"[19] Responses to 9 to 11 hours of sleep per night for students aged 5 to 13 years and responses to 8 to 10 hours for students aged 14 to 17 years corresponded to that of adolescents who met the sleep duration guideline range. Other response options were collapsed to show students who did not get the amount of sleep recommended.

Bullying. Experience of bullying perpetration and victimization in the last 12 months was measured by Chinese version of bully scale from the victims' and bullies' perspective.[20] Physical bullying, verbal bullying, and relational bullying were assessed by this scale. Specifically, the three forms of bully mainly include the following behaviors. Physical bullying includes (1) physical violence, kicked or beaten others/was kicked or beaten others; (2) force others or threatened to do something/be forced or be threatened to do something; and (3) deliberately destroy other people's things/something was deliberately damaged. Verbal bullying includes linguistic violence, (was) malicious nicknames or ridicule, or insults. Relational bullying includes (1) (was) spread rumors or slander and (2) (was) isolation or exclusion. Responses include "yes" and "no." Students who reported being bullied by any kind of bully behavior were recognized as victims, and those who responded bullying others with any kind of behavior were recognized as bullies. Participants who have bullied others and have been bullied in the last year were considered as bully-victim. Given the previous studies, the reliability was acceptable of this scale in Chinese children and adolescents.[20]

Statistical Analysis

Generalized linear model analyses were used to examine the associations between meeting general combination (the number of guidelines met, range 1-3) and specific combinations (none/sleep only/screen only/MVPA only/sleep + screen/sleep + MVPA/screen + MVPA/all) of 24-hour movement guidelines for MVPA, screen time, and sleep duration with co-occurrence of bullying victimization and perpetration. All models were fully adjusted with covariates (ie, age, sex, grade, body mass index (BMI), school, nationality, district, siblings, family structure, parental education, subjective family, and socioeconomic status [SES]). A *P*-value that was less than .05 was statistically significant.

Results

Descriptive Analysis

The descriptive rate of bullying and perpetration, and movement behaviors was shown in Supplementary Table 2. There are significant gender differences in bullying and movement behavior. Except for relational bullying victimization, other types showed that males (vs females) are more likely to bully others or be bullied (see Supplementary Figure 1). Females were more likely than males to meet the screen time guideline only or none of recommendation ($P < .001$),

Table 2. Association Between General and Specific Combination of Movement Behavior Recommendations and Verbal Bullying.

	Verbal victim		Verbal bully		Verbal bully-victim	
	OR	95% CI	OR	95% CI	OR	95% CI
Specific combinations						
All	0.67***	[0.57, 0.79]	0.35***	[0.24, 0.50]	0.36***	[0.24, 0.53]
Screen + MVPA	1.01	[0.92, 1.12]	0.64***	[0.53, 0.77]	0.64***	[0.51, 0.79]
Sleep + MVPA	0.92	[0.75, 1.12]	0.58**	[0.40, 0.84]	0.60**	[0.40, 0.92]
Sleep + Screen	0.63***	[0.58, 0.68]	0.51***	[0.44, 0.58]	0.52***	[0.44, 0.61]
MVPA only	1.16**	[1.03, 1.30]	1.09	[0.91, 1.30]	1.09	[0.89, 1.34]
Screen only	0.78***	[0.74, 0.81]	0.60***	[0.55, 0.66]	0.60***	[0.55, 0.66]
Sleep only	0.84***	[0.77, 0.91]	0.79**	[0.69, 0.91]	0.83**	[0.71, 0.96]
None (ref)	—	—	—	—	—	—
General combinations						
Three	0.67***	[0.57, 0.79]	0.35***	[0.24, 0.49]	0.35***	[0.23, 0.53]
Two	0.74***	[0.69, 0.79]	0.55***	[0.49, 0.66]	0.55***	[0.48, 0.63]
One	0.80***	[0.77, 0.84]	0.66***	[0.61, 0.71]	0.67***	[0.61, 0.73]
None (ref)	—	—	—	—	—	—

Abbreviations: MVPA, moderate-to-vigorous physical activity; OR, odds ratio.
*$P < .05$. **$P < .01$. ***$P < .001$ (two-tailed t test).

while males (vs females) were significantly more likely to meet sleep duration guideline, MVPA guideline, screen time + MVPA guideline, sleep duration + MVPA guideline, sleep duration + screen time guideline, screen time recommendation only, sleep duration recommendation only, and all three recommendations.

Movement Behavior and Bullying

Compared with meeting no recommendations (see Table 1), meeting all three recommendations was associated with a lower odds of being a physical victim (odds ratio [OR]: 0.64, $P < .001$), perpetration (OR: 0.34, $P < .001$), or a bully-victim (OR: 0.19, $P < .001$) compared with students who do not meet any recommendations. Meeting one to two recommendations related to the sleep duration and screen time could be the protective factors of physical bullying including the victim, bully, and bully-victim. Specifically, meeting sleep duration and screen time, screen time only, and sleep duration only was associated with lower odds of being a victim (OR: 0.62-0.79, $P < .001$), a bully (OR: 0.43-0.71, $P < .001$), or a bully-victim (OR: 0.41-0.75, $P < .001$). Meeting both screen time and MVPA recommendation was associated with lower odds of being a bully (OR: 0.71, $P < .01$) or a bully-victim (OR: 0.72, $P < .01$), and meeting both sleep duration and MVPA recommendation was associated with lower odds of being a bully (OR: 0.66, $P < .05$). However, meeting the MVPA recommendation only was associated with a higher odds of being a victim (OR: 1.21, $P < .01$).

Compared with not meeting any recommendations (see Table 2), meeting all three recommendations was associated with lower OR being a verbal victim (OR: 0.67, $P < .001$), perpetration (OR: 0.35, $P < .001$), or a bully-victim (OR: 0.35, $P < .001$). Meeting one to two recommendations related to the sleep duration and screen time may be the protective factors of physical bullying, including victim, bully, and bully-victim. To be specific, meeting both screen time and MVPA recommendation, both sleep duration and MVPA guidelines were associated with lower odds of being a bully or a bully-victim (OR: 0.58-0.64, $P < .01$). Meeting both sleep duration and screen time recommendations, screen time only, and sleep duration only guideline was associated with lower odds of being a victim (OR: 0.63-0.84, $P < .01$), a bully (OR: 0.51-0.79, $P < .001$), or a bully-victim (OR: 0.52-0.83, $P < .001$). Meeting the MVPA recommendation only was associated with a higher odds of being a verbal victim (OR: 1.16, $P < .01$).

Meeting more recommendations was associated with lower odds of being a victim, a bully, or a bully-victim (see Table 3). Meeting one to two recommendations related to the sleep duration and screen time may be the protective factors of physical bullying, including victim, bully, and bully-victim. Specifically, meeting MVPA recommendation only was associated with higher odds of being a victim (OR: 1.24, $P < .01$). Meeting sleep duration and screen time, meeting screen time only, and meeting sleep duration only were associated with lower odds of being a victim (OR: 0.60-0.79, $P < .001$), a bully (OR: 0.49-0.74, $P < .001$), or a bully-victim (OR: 0.47-0.76, $P < .001$). Meeting both screen time and MVPA recommendation was associated with a lower odds of being a bully (OR: 0.74, $P < .01$) or a bully-victim (OR: 0.73, $P < .01$), while meeting both sleep duration and MVPA recommendation was associated with lower odds of being a bully (OR: 0.59, $P < .05$).

Discussion

This study explored the potential exposures between healthy movement and being involved in a bullying incident as a

Table 3. Association Between General and Specific Combination of Movement Behavior Recommendations and Relational Bullying.

	Relational victim		Relational bully		Relational bully-victim	
	OR	95% CI	OR	95% CI	OR	95% CI
Specific combinations						
All	0.67***	[0.57, 0.79]	0.30***	[0.19, 0.47]	0.30***	[0.18, 0.49]
Screen + MVPA	1.01	[0.92, 1.12]	0.74**	[0.60, 0.90]	0.73**	[0.58, 0.91]
Sleep + MVPA	0.90	[0.74, 1.11]	0.59*	[0.38, 0.90]	0.70	[0.45, 1.09]
Sleep + Screen	0.60***	[0.56, 0.65]	0.49***	[0.42, 0.58]	0.47***	[0.39, 0.56]
MVPA only	1.24***	[1.11, 1.39]	0.89	[0.71, 1.11]	0.82	[0.63, 1.06]
Screen only	0.79***	[0.75, 0.83]	0.62***	[0.56, 0.68]	0.60***	[0.54, 0.66]
Sleep only	0.79***	[0.73, 0.86]	0.74***	[0.63, 0.87]	0.76**	[0.64, 0.90]
None (ref)	—	—	—	—	—	—
General combinations						
Three	0.67***	[0.57, 0.79]	0.30***	[0.19, 0.47]	0.29***	[0.18, 0.48]
Two	0.72***	[0.68, 0.77]	0.56***	[0.49, 0.64]	0.55***	[0.47, 0.63]
One	0.81***	[0.78, 0.85]	0.65***	[0.60, 0.71]	0.63***	[0.57, 0.70]
None (ref)	—	—	—	—	—	—

Abbreviations: MVPA, moderate-to-vigorous physical activity; OR, odds ratio.
*$P < .05$. **$P < .01$. ***$P < .001$ (two-tailed t test).

bully or a victim in a representative sample of adolescents in China. Overall, the results indicated that meeting more commendations was associated with lower odds of all forms of bullying victimization and perpetration. Although students meeting MVPA recommendation only reported higher odds of being victims in all forms of bullying, meeting other guidelines combined with MVPA would relate to lower odds of being a bully and a bully-victim in all forms of bullying involvement.

Meeting more recommendations was associated with lower odds of all types of bullying involvement, which was in line with the previous study.[9] With the combination of being active in physical activities, sleeping enough, and limiting screen time, students may be less likely to be depressive and anxious[21] and more likely to have positive and high-quality peer relationships and social support.[22] Stronger peer-relationship support may further contribute to their better integration into the school-based group and protect them from becoming the target of bullying.[23] In addition, meeting the 24-hour guideline prevented students to be perpetrators of bullying since being active in physical activities, sleeping enough, and limiting screen time contributed to students' executive function (e.g., self-regulation, decision-making) and social connectedness compared with those who did not meet the guidelines.[24] Therefore, students who met the 24-hour guideline recommendations are less likely to involve in aggressive behavior.[25] Although there is no causation relationship that can be concluded from our results, our findings support that meeting all three movement recommendations of adolescents may help reduce all forms of bullying involvement.

Students who meet screen time recommendation only, meet sleep duration recommendation only, or meet both two may contribute to preventing from involving all forms of bullying events. These findings are consistent with the previous studies, which support the protective effect of limited screen time and adequate sleep duration on bullying involvement.[9] Notably, we found an unexpected relationship between meeting MVPA recommendation only and bullying victimization, which showed meeting MVPA recommendation only reported higher odds of being victims in all forms of bullying. Sampasa-Kanyinga et al[9] found that there was no significant relationship between meeting the MVPA recommendation only and bullying involvement, which was less consistent. Nevertheless, previous studies pointed out that bullying others can be considered a functional behavior in achieving peer status acquisition.[26] Thus, "beating" students who are active in physical activities or physically strong may become an effective way to improve their peer status. Moreover, students spending more time in sports venues (e.g., gym, playground), the common locations for bullying,[27] will lead to a higher probability to be the targets of bullying. It is noteworthy that this significant relationship may be due to the measurements of MVPA in our study without distinction between competitive sports and non-competitive sports since the former may create an environment to support bullying unconsciously.[28] As the specific influence process of the relationships is hard to conclude from this study, more empirical research is needed to elucidate the relationship between physical activities and bullying involvement. In addition, although there was no statistical significance in the association between meeting MVPA recommendation only and students being perpetrators or bully-victims, OR values greater than 1 can indicate that it also tends to be a risk factor.

Of relevance, the current results found that a specific combination of MVPA and screen time or sleep time was associated with lower probabilities of adolescents' bullying

involvement to varying degrees. Specifically, meeting both screen time and MVPA recommendations may protect adolescents from being bullies and bully-victims of all forms of bullying, while students meeting both sleep time and MVPA recommendations may be less likely to be bullies in all forms of bullying and be bully-victims in verbal bullying. The current study suggested that when meeting MVPA recommendation was identified as a risk factor for bullying others, adequate sleep duration and limited screen time could alleviate this association. Intense physical activities, exceptionally competitive sports, may be characterized by activating irritability and impulsive behavior in children and adolescents.[29] However, adequate sleep duration and limited screen time can be effective in emotion regulation and inhibition of impulsive and aggressive behavior,[24,30] which can effectively reduce the incidence of bullying in sports settings. Thus, adolescents need to be encouraged to develop two or more healthy movements, which ensure a reduction in bullying involvement. Similar results were first reported in current research, which needs to be further confirmed in the future study.

The current study has extended the existing research in this field, by assessing the different combinations of physical activity, screen time, and sleep duration using a large and representative population of adolescents. In addition, we adjusted models with many related covariates, which can effectively reduce confounding bias. However, there are some limitations in this study. First, the measurement of bullying was based on self-report, which might lead to desirability and recall biases. Future studies could consider combining data from multiple reports, such as peer reports. Second, the current study addressed cross-sectional design, which was unable to draw a causal conclusion. Future research could further explore the predictive effect of movement behavior on bullying through a longitudinal study design. Third, this study did not include minority groups (e.g., students with disabilities) as covariates. Fourth, we used only one single item to measure participants' sleep duration, physical activity, and screen time, respectively, which might fail to obtain a more accurate estimation. Future research could use a more multifaceted measurement, such as a combination of self-reported scales and objective measures (e.g., accelerometers for sleep and physical activity). Finally, this study only explored the relationship between movement behavior and bullying experience, but little was known about how the frequency of bullying experience interacts with movement behavior, which could be explored in depth in future studies.

Conclusion

There is a close association between 24-hour movement behavior and bullying involvement among Chinese adolescents. For general combinations of three guidelines (physical activity, screen time, sleep duration), meeting more recommendations was associated with lower odds of bullying involvement including victimization and perpetration. For specific combinations of movement recommendations, the current study indicates a positive relationship between meeting sleep time and screen time recommendations and bullying involvement, while the relationship between meeting MVPA recommendation and bullying involvement is still unclear. As educators and primary caregivers, students need to be encouraged to have adequate sleep duration and limiting screen time, and appropriate physical activity.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The study was funded by the Natural Science Foundation of Guangdong Province (No. 2021A1515011330) and National Social Science Foundation of China (No. 16CSH049).

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Supplemental Material

Supplemental material for this article is available online.

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