REVIEW ARTICLE

Ann Acad Med Singap 2022;51:292-9
https://doi.org/10.47102/annals-acadmedsg.202141

Consensus statement on Singapore integrated 24-hour activity guide for children and adolescents

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ABSTRACT

Introduction: Lifestyle activities, such as regular physical activity, are important for good metabolic health and the prevention of non-communicable diseases. Epidemiological studies highlight an increase in the proportion of overweight children in Singapore. A workgroup was formed to develop recommendations to encourage children and adolescents (aged 7–17 years) to adopt a holistic approach towards integrating beneficial activities within a daily 24-hour period for good metabolic and general health.

Methods: The Grading of Recommendations Assessment, Development and Evaluation (GRADE) Evidence to Decision framework was employed to formulate the public health question, assess the evidence and draw conclusions for the guide. The evidence for international 24-hour movement guidelines, and guidelines for physical activity, sedentary behaviour, and sleep and eating habits were reviewed. An update of the literature review from August 2018 to end of September 2020 was conducted through an electronic search of Medline and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases.

Results: Ten consensus statements were developed. The statements focused on the overall aim of achieving good metabolic health through integration of these activities and initiatives: light and moderate- to vigorous-intensity physical activity on a regular basis; muscle- and bone-strengthening activities; limiting sedentary behaviour; regular and adequate sleep; good eating habits and choosing nutritionally balanced foods and drinks; practise safety in exercise; and aiming to achieve more or all aforementioned recommendations for the best results.

Conclusion: This set of recommendations provides guidance to encourage Singapore children and adolescents to adopt health-beneficial activities within a 24-hour period.

Ann Acad Med Singap 2022;51:292-9

Keywords: Eating habits, metabolic health, physical activity, sedentary behaviour, sleep

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CLINICAL IMPACT

What is New

- This article reviews the relationship between lifestyle activities and health outcomes among children and adolescents in Singapore.
- Appropriate eating habits could optimise metabolic health and prevent the onset of non-communicable diseases.

Clinical Implications

- This article provides an updated review of evidence supporting the benefits of regular physical activity, low sedentary behaviour, adequate sleep and good eating habits for healthy children and adolescents in Singapore.

INTRODUCTION

The World Health Organization's *Global action plan for the prevention and control of noncommunicable diseases 2013–2020* provided guiding principles for national efforts in controlling and reducing non-communicable diseases (NCDs).[1] The major NCDs include cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes—they form a major public health challenge, and are a heavy burden on the health and social systems.[2] The metabolic risk factors for NCDs are hypertension, overweight or obesity, hyperglycaemia and hyperlipidaemia, and these risk factors are often manifestations of unhealthy but modifiable lifestyle behaviours that include physical inactivity and unhealthy diet.[1] Therefore, the prevention of these metabolic risk factors through community-based interventions to support behavioural changes have been highlighted as important and cost-effective strategies to reduce NCDs.[3]

Many national guidelines for promoting healthy lifestyle behaviours focus on specific behaviours such as physical activity[4] or healthy eating habits.[5] With increasing recognition of the detrimental health effects of sedentary behaviour, recommendations on sedentary behaviour have been included in some physical activity guidelines.[6,7] However, there is emerging evidence that further points to strong relationships among these lifestyle behaviours and their health effects. Specifically, various combinations of physical activity, sedentary behaviour and/or sleep can achieve similar health benefits.[8,9] This novel evidence-based approach of assimilating multiple lifestyle behaviours, framed within a 24-hour period into a singular guide, has provided a fresh and practical perspective on health promotion.[10,11] To the best of our knowledge, this paper describes the first Singapore consensus statement on health promotion recommendations for children and adolescents using this integrated approach, and is the only integrated guide to date that includes eating habits.

Promoting healthy lifestyle behaviours

For children and adolescents, physical activity is encouraged for leisure (e.g. play, sports or planned exercise), as part of physical education, or for transportation (e.g. walking, running and cycling) in the context of home, school or community setting.[12] Children and adolescents should have access to safe and equitable opportunities to participate in varied physical activities that are enjoyable, as well as age- and ability-appropriate, either individually or in groups.[13]

Periods of sedentary behaviour and recreational screen time should be kept to a minimum.[14] Management of these periods can be improved by setting boundaries (e.g. duration) or interrupted with regular breaks for physical activity.[15] Establishing a consistent bedtime routine is important to help children and adolescents achieve regular and adequate sleep time.[16] Adoption of healthy eating habits and choosing nutritious foods and drinks in appropriate portions will not only supply adequate energy for daily activities, but also support optimal growth and development.[17]

Studies on Singapore children and adolescents

Statistics from the Ministry of Education, Singapore revealed that the proportion of overweight children increased from 11% in 2013 to 13% in 2017.[18] Research on children and adolescents in Singapore has shown that they could only meet up to 40% of the recommended level of physical activity, and more than 70% of adolescents exceeded >2 hours of electronic screen time daily.[19,20] However, a study by Lye et al. involving 233 adolescents showed that none of the participants achieved the recommended 60 minutes of moderate-to vigorous-intensity physical activity, and that they engaged in significantly more time in sedentary activity.[21] Furthermore, screen time has increased due to the COVID-19 pandemic and introduction of home-based learning.[22] A 2020 survey of 100 children aged 5–14 years also revealed that 32% did not participate in moderate-intensity physical activity. In fact, on weekdays, 23% had prolonged sedentary behaviour of >10 hours/day, and 18% had insufficient sleep of <8 hours/day.[23] These developments have prompted healthcare professionals to provide guidance using an integrated approach for children and adolescents in Singapore towards better health.

Aim of consensus statement

Our objective is to provide guidance to encourage children and adolescents in Singapore to adopt a holistic approach towards integrating all types of activity within a daily 24-hour period. These activities (including light, moderate and vigorous physical activity, sedentary behaviour and sleep) are closely inter-related in terms of health benefits and time consumption. The inclusion of eating habits in our recommendations also completes our discussion towards an optimal metabolic cycle. It is equally vital to understand the importance of each type of activity and to organise these activities throughout a day and night schedule for the best health outcomes.

These recommendations to follow are for all healthy children and adolescents (aged 7–17 years)—irrespective of sex, cultural background or socio-economic status. Children and adolescents with special needs or medical conditions should consult a qualified medical professional for additional guidance.

METHODS

The consensus workgroup consisted of physicians (paediatricians, sports physicians and family physicians), allied health professionals (exercise physiologist and dietitian), academics and researchers from multiple institutions.

The workgroup assessed and included evidence reviews from both the Canadian 24-hour movement guidelines for children and youth, and the Australian 24-hour movement guidelines for children and young people, which were published in Medline, Embase, PsycInfo and SPORTDiscus from inception through to July 2018.[8,24-27] An update of the literature review from August 2018 to end of September 2020 was conducted through an electronic search of Medline and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases, using the following keywords: "physical activity", "sedentary behaviour", "sleep", "eating habit", "paediatric", "child" and "adolescent". Only results in English language were considered. Studies identified included systematic reviews, randomised control trials and cohort studies. Health outcomes included cardiometabolic risk factors, physical fitness, bone health, adiposity, emotional or psychological well-being, behavioural or cognition development, quality of life, and safety or injury.

The workgroup used the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Evidence to Decision (EtD) framework to evaluate the quality of the evidence and strength of recommendation, and to provide a structured and clear methodology for healthcare recommendations.[28,29] The full EtD framework is available in the online supplementary material of this article. The online annexes include the presentation of all consensus statements, a practical reference for promotion of physical activity and a summary version of this activity guide. These recommendations are intended for healthcare professionals who provide holistic care for children and adolescents, including educating, encouraging and promoting beneficial activities for practice through to adulthood for a lifetime of good health.

Limitations

The workgroup utilised the online interactive EtD (iEtD) tool[29] for the EtD framework, and the information presented is limited by the online tool.

RESULTS

Consensus statements

1. For physical, mental and social health, children and adolescents should acquire a lifestyle that integrates regular physical activity, limited sedentary behaviour, adequate sleep, and good eating habits within each 24-hour period.

Physical activity is essential for healthy growth and development in children and adolescents.[24] Research shows that regular physical activity improves aerobic fitness, body composition, metabolic risks, musculoskeletal health, mental health and academic results in children and adolescents.[6,24,30] Emergent evidence shows that prolonged sedentary behaviour, particularly unregulated and unrestrained screen time, is associated with a range of adverse health outcomes including obesity.[31,32] Sleep duration and quality significantly impact child and adolescent health, as shorter sleep duration is associated with childhood obesity.[26,33] Good eating habits, together with consumption of nutritious foods and drinks, balance the metabolic cycle by supplying energy for daily activities, growth and development.[17] The challenge is to incorporate adequate physical activity, low sedentary behaviours, and adequate sleep duration for the best health outcomes in children and adolescents.[34]

2. Accumulate at least an average of 60 minutes/day of moderate- to vigorous-intensity physical activity in a week, where more is better.

The premise of a healthy lifestyle includes regular physical activity participation. In children and adolescents, regular physical activity or physical sport participation is associated with lifelong health benefits.[7,24,35,36] Activities of all types and performed across all intensity levels should be encouraged to

promote habitual physical activity or active play, physical sports engagement, and development of health-related and skill-related fitness.[7,35,37,38]

To achieve substantive health benefits, children and adolescents should aim to accumulate an average of ≥60 minutes of physical activity (including active or outdoor play, games, sports, physical education, and planned exercise or transportation) per day in a week, and most of these activities should be of at least moderate intensity.[6,7,24,36] For greater health gains, vigorous intensity activities should in incorporated where possible.[6,7,24]

3. Engage in muscle- and bone-strengthening exercises at least 3 times a week. This could be part of the daily minimum accumulation of 60 minutes of moderate- to vigorous-intensity physical activity.

Muscle- and bone-strengthening exercises should be incorporated into a child's physical activity regime.[6,7,36,39] These exercises range from weight-bearing activities, resistance exercise using body or light weights, or light-impact exercises such as skipping, hopping or jumping.[39,40] The inclusion of these activities promotes strength gains, and development of strong joints and healthy bones, both of which are vital for optimal growth and development.[39-41] Building an early foundation of good joint and bone health during childhood helps to prevent injuries, improve exercise performance, and prevent the development of bone-related health issues in the future.[40,41]

4. Engage regularly in a variety of light physical activities throughout the day.

Light physical activities can range from static (e.g. standing) to dynamic (e.g. slow walking).[42] Every choice counts, given that even light-intensity physical activity has health benefits; choosing the more active option, even if it is for light-intensity physical activity, is beneficial.[43] Some examples include standing and moving about rather than sitting down, taking a walk rather than driving, and taking the stairs instead of the lift or escalator. Children should be encouraged to participate in active play, especially outdoor play, rather than playing with screen devices.[44] Setting a target to achieve an accumulated 12,000 steps/day also helps children and adolescents meet the daily physical activity recommendation.[37,38,45]

5. Limit recreational screen time as much as possible.

Recreational screen time activities include watching the television; using the computer, tablet or phone; and engaging in video games that are physically non-active or inactive in nature.[46,47] Among all the sedentary activities, recreational screen time >2 hours daily is associated with the most adverse health outcomes in children and adolescents.[32,47] The benefits of limiting this screen-based sedentary behaviour include reduced adiposity, improved motor and cognitive development, and better psychosocial health.[32,48] Providers should address this behaviour by assessing the duration and use of recreational screen time, and suggesting parenting strategies to limit screen time as much as possible.[32,46,48,49]

6. Build in regular breaks to move around during times of prolonged sitting or inactivity.

There are inevitable situations when children are required to remain seated for prolonged periods, such as during lessons in the classroom or a long-distance trip. Prolonged sedentary behaviour is damaging to health, but when this is unavoidable, include regular breaks to encourage frequent movement and physical activity. While this contributes to a child's overall physical activity levels,[50] it is also beneficial for their mental and social health.[30] These activity breaks also help children to better concentrate in school.[51] A few minutes of "movement break" (i.e. intervals for movement and physical activity) for every 30–60 minutes of sedentary time, together with play during break times, should help limit the impact of prolonged physical inactivity.[52]

7. Have regular sleep of at least 9 hours (for 7–13-year-olds) and at least 8 hours (for 14–17-year-olds).

Sleep is a critical component of mental and physical health that is often sacrificed to make time for daytime activities. Achieving the number of recommended hours of sleep regularly is associated with better health outcomes in terms of attention, memory, learning, behaviour, emotional regulation, quality of life, and mental and physical health.[53] Insufficient sleep increases the risk of accidents and injuries, especially during physical activity, and in the long term, is associated with obesity, hypertension, diabetes and depression.[53-55] Children (7–13 years) should regularly sleep 9–12 hours per 24 hours, and teenagers (14–17 years) 8–10 hours.[53,56]

8. Take the necessary precautions before, during and after exercise and see a doctor if you feel unwell during the exercise.

The benefits of physical activity outweigh its risks. Safety is key in minimising injuries during physical activities or in organised sports. This will ensure the child's well-being and continued participation in exercise and sports in the long term.[57] Good practices

include the use of appropriate equipment and footwear, exercising in conditions that are free of hazards (such as broken equipment and uneven surfaces), and avoid exercising in extremely hot and humid conditions.[58] We encourage children to regularly perform warm-ups before exercise and cool-down stretching post activity,[58] hydrate adequately, and apply protection against the sun and insects before and during exercise.[59]

For all participants in organised sports, it is important to understand and follow the rules of the specific sport, as well as having adequate practice of the skills needed for the relevant activities.[58] It is also beneficial to have the proper conditioning for fitness, strength and flexibility appropriate to the sports activities undertaken.[58,60] Children should engage in a variety of activities throughout the year, and avoid specialising in a single sport at a young age.[60,61]

If the child is unwell, he/she should avoid strenuous activities.[59] If the child experiences chest pain, breathlessness, palpitations or dizziness, he/she should stop the activity and seek medical attention if these symptoms are persistent.[62] Children with pre-existing medical condition(s) should discuss with their doctors for the necessary precautions and/or restrictions before engaging in strenuous exercises.[59]

9. Have regular meals consisting of nutritionally balanced foods and drinks to support daily activities, in order to optimise growth, maturation and development.

The social and ecological environment can strongly influence the dietary choices of the individual and their families.[63] Through parental modelling, a regular household eating routine provides opportunities for coordinated family meals and regulation of appetite, therefore affecting the overall diet quality of children and adolescents.[63,64] Consuming a nutritious breakfast as part of a daily routine has also been associated with positive outcomes, including better diet quality and healthy body weight, and is strongly encouraged.[64]

Part of achieving a healthy eating pattern requires a conscious selection of food and drinks in age-appropriate portions that support a child's activity levels and growth. Suitable portions can be planned using visual aids, such as My Healthy Plate, a visual guide designed by the Singapore Health Promotion Board. A variety of foods across and within all food groups are required to meet nutrient requirements.[22,64] Nutritionally balanced foods and drinks include all vegetables, fruits, whole grains, lean meats and poultry, seafood, legumes, unsalted nuts, low-fat dairy products; foods free of saturated and trans fats; and foods prepared with limited solid fats (e.g. butter), sugars and refined starches.[65] Limiting consumption of added sugars; sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates; and sugar-sweetened beverages to not more than 10% of total energy intake can curb the risk of increased adiposity and being overweight in children, as well as the formation of dental caries.[66]

10. Aim to achieve most or all recommendations on physical activity, sedentary behaviour, sleep and diet for the best results.

These recommendations on physical activity, sedentary and sleep behaviours are of comparable importance, and meeting more of these recommendations will correspondingly improve the health indicators for physical, mental and social health.[9,67] Therefore, children and adolescents who can meet all recommendations (i.e. high moderate- to vigorous-intensity physical activity, low sedentary behaviour, adequate sleep, and age- and intensity-appropriate diet) are shown to have the best health outcomes.[8,68,69]

Similar health outcomes can be achieved by meeting the same number of recommendations in various combinations.[67] This means that comparable health indicators can be achieved through high moderate- to vigorous-intensity physical activity and low sedentary behaviour; adequate sleep and low sedentary behaviour; or high moderate- to vigorous-intensity physical activity and adequate sleep.[8,67,70] In conclusion, children and adolescents can start with any of these recommendations, with the eventual aim of meeting all recommendations for the best health outcomes.

About the workgroup

This document was developed by the Singapore Integrated 24-Hour Activity Guide for Children and Adolescents Study Workgroup, which comprised key members from the Singapore community, including members from the College of Paediatrics and Child Health of the Academy of Medicine, Singapore; Singapore Integrated Platform for Research in Advancing Metabolic Health Outcomes in Women and Children (IPRAMHO), led by KK Women's and Children's Hospital (KKH), in partnership with SingHealth Polyclinics (SHP) and the National Healthcare Group Polyclinics (NHGP), Perinatal Society of Singapore, and Exercise is Medicine Singapore. The initiative is supported by the research group of IPRAMHO, a National Medical Research Council-funded joint collaborative pot centre grant of KKH, SHP and NHGP. This multidisciplinary group is initiated by Assoc Prof Ng Kee Chong and Prof Tan Kok Hian, and chaired by Dr Benny Loo Kai Guo.

Disclaimer

This guide endorsed by the College of Paediatrics and Child Health of the Academy of Medicine, Singapore, and supported by the Health Promotion Board, Singapore. Partners of the guide include Exercise is

Medicine Singapore, Sports Medicine Association Singapore, Perinatal Society of Singapore, Singapore Paediatric Society, College of Family Physicians Singapore, and Singapore Medical Association. The guide acts as an educational aid and reference for healthcare professionals practising in Singapore. The guide does not define a standard of care, nor is it intended to dictate an exclusive course of management. It presents recognised clinical methods and techniques for consideration by practitioners for incorporation into their practice. It is acknowledged that management may vary and must always be responsive to the need of individual patients, resources, and limitations unique to the institution or type of practice.

Acknowledgements

We would like to acknowledge Senior Professor Anthony Okely from the School of Health and Society at the University of Wollongong, Australia, for his assistance in reviewing the manuscript.

Online annexes

1. Consensus Statement on Singapore Integrated 24-Hour Activity Guide for Children and Adolescents: Consensus Statements

2. Practical Reference for Physical Activities for Children and Adolescents

3. Consensus Statement on Singapore Integrated 24-Hour Activity Guide for Children and Adolescents: Summary Guide

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