

Asia-Pacific Consensus Statement on integrated 24-hour activity guidelines for children and adolescents

Benny Kai Guo Loo ¹, Anthony David Okely,^{2,3} Aman Pulungan,⁴ Muhammad Yazid Jalaludin,⁵ Asia-Pacific 24-Hour Activity Guidelines for Children and Adolescents Committee

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2021-104527>).

¹Department of Paediatrics, KK Women's and Children's Hospital, Singapore

²School of Health and Society, University of Wollongong, Wollongong, New South Wales, Australia

³Illawarra Health and Medical Research Institute, Wollongong, New South Wales, Australia

⁴Child Health Department, Universitas Indonesia-Cipto Mangunkusumo Hospital, Depok, Jawa Barat, Indonesia

⁵Department of Paediatrics, University of Malaya, Kuala Lumpur, Wilayah Persekutuan, Malaysia

Correspondence to

Dr Benny Kai Guo Loo, Paediatric Medicine, KK Women's and Children's Hospital, Singapore, Singapore; benny.loo.k.g@singhealth.com.sg

Accepted 19 October 2021

Published Online First

8 November 2021

ABSTRACT

Non-communicable diseases (NCDs) constitute a significant public health challenge and pose a great burden on health and social systems throughout the world. The Asia-Pacific region is in a vulnerable position as the prevalence of NCDs will inevitably increase with rapid socioeconomic transitions; yet it is ill prepared for this public health challenge as Asian children are among the most physically inactive in the world. Aligned with the WHO's global strategy to control NCDs via preventive measures and health promotion policies, representatives from the Asia-Pacific region came together to develop consensus statement on integrated 24-hour activity guidelines for children and adolescents. These guidelines apply to children and adolescents, aged 5–18 years, in the Asia-Pacific region, regardless of gender, cultural background or socioeconomic status. These guidelines aim to provide the latest evidence-based recommendations, taking a holistic approach to lifestyle activities and adopting a practical perspective by framing these activities within a 24-hour period. Eating and dietary elements were incorporated as they closely influence the energy balance of the movement behaviours and vice versa. By investing in the younger generations through advocacy for healthier lifestyles, we aim to reduce the burden of NCDs in the Asia-Pacific region.

PREAMBLE

The objective of the Asia-Pacific Consensus Statement on integrated 24-hour activity guidelines for children and adolescents was to provide all physicians and healthcare providers the latest evidence-based recommendations on beneficial lifestyle habits in children and adolescents. Children and adolescents are encouraged to adopt a holistic approach towards integrating different types of activity within a 24-hour period—physical activity, sedentary behaviour, sleep and eating habits.

These guidelines apply to children and adolescents, including those living with disability, aged 5–18 years, in the Asia-Pacific region, regardless of gender, cultural background, socioeconomic status. Children and adolescents living with chronic medical conditions should consult a health professional for additional guidance.

All participating members are encouraged to adopt and adapt the guidelines for their local populations of children and adolescents. Following these guidelines is associated with multiple health benefits, including better body composition,

cardiovascular and metabolic health, musculoskeletal fitness and overall quality of life. By achieving these health benefits, we aim to reduce the risks of non-communicable diseases (NCDs) among children and adolescents in the Asia-Pacific region.

BACKGROUND

NCDs constitute a significant public health challenge and pose a large burden on health and social systems throughout the world.¹ NCDs are chronic medical conditions which include cardiovascular diseases, cancers, chronic respiratory diseases and diabetes.² These conditions often result from modifiable lifestyle risk factors, such as physical inactivity and unhealthy diet, resulting in metabolic risk factors, including obesity, raised blood pressure, increased blood glucose and raised blood lipids.³

Metabolic morbidities in children, especially obesity, are one of the more critical NCDs of today and are not only seen in developed countries but also affect low/middle-income countries in the Asia-Pacific region.^{4,5} In 2018, the estimated prevalence of obesity (based on International Obesity Task Force definition) in Asian children and adolescents was 5.8% and 8.6%, respectively.⁶ These figures are expected to increase as many Asian and Pacific countries undergo rapid socioeconomic transitions with urbanisation and growing influence of western lifestyles.⁷

In stark contrast, many children and adolescents in the Asia-Pacific region are not adequately active. Asian school-going adolescents showed lower physical activity levels compared with other parts of the world and published data revealed that only 6% met WHO's recommendation of 60 min of moderate- to vigorous-intensity physical activity (MVPA) daily.⁸ Similarly, another study on school-going adolescents from Association of Southeast Asian Nations (ASEAN) countries showed that 80.4% of the samples achieved less than 60 min of MVPA on at least 5 days per week and 33.0% of the samples had significant sedentary behaviour, defined as 3 or more hours of sitting per day.⁹

The concept of integrating various forms of activities within a 24-hour period for children and adolescents was introduced in several national guidelines—Canada in 2016, Australia in 2019 and Singapore in 2021.^{10–12} The integration of these activities (ie, physical activity, sedentary behaviour and sleep) is an acknowledgement of the lifestyle of a modern child or adolescent and recent evidence has shown that these activities exert health effects both individually and also in association with



© Author(s) (or their employer(s)) 2022. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Loo BKG, Okely AD, Pulungan A, et al. *Br J Sports Med* 2022;**56**:539–545.

each other.¹³ As dietary patterns can affect a person's metabolic health such as obesity and cardiometabolic risk factors, we have included a statement on healthy eating habits into the guidelines.^{14 15} Food habits, eating behaviours and movement behaviours closely influence each other in terms of energy balance.^{16 17} For example, through increased opportunities for food and drink intake during prolonged periods of sedentary behaviour or longer wake periods (as a result of less sleep). Skipping meals such as breakfast may deprive children and adolescents of important energy requirements needed for participation in physical activity.¹⁸ Framing these activities within a 24-hour period emphasises that the whole day matters and the importance of organising these activities, especially in contemporary fast-paced societies.

As children and adolescents in the Asia-Pacific region share common risk factors for NCDs which may be dissimilar to other regions, a set of region-specific recommendations can consolidate the Asia-Pacific nations' efforts in combating NCDs through health promotion. This report outlines the process and outcomes for the development of the 'Asia-Pacific Consensus Statement on Integrated 24-Hour Activity Guidelines for Children and Adolescents'.

METHODS

Literature reviews

The evidence reviews conducted for the development of the Canadian 24-hour movement guidelines for children and youth (conducted by Poitras *et al*, Carson *et al*, Chaput *et al* and Saunders *et al*),^{13 19-21} the Australian 24-hour movement guidelines for children and young people (conducted by Okely *et al*),²² and the Singapore integrated 24-hour activity guidelines for children and adolescents (conducted by Loo *et al*) were included in the literature review for the development of the Asia-Pacific guidelines.¹² We also reviewed the evidence used for international and regional eating and dietary guidelines. An update of the literature review up to November 2020 was conducted using MEDLINE and CINAHL databases. The searches included systematic reviews and cohort studies on physical activity, sedentary behaviour, sleep and the integration of these three behaviours and eating habits. Only studies published in English language were considered.

Grading of evidence and recommendations

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) method was applied to rate the quality of evidence and strength of recommendations.²³ The ratings from the Canadian, Australian and Singapore guidelines were also reviewed and updated. The evidence was rated as very low, low, moderate or high.²⁴

The GRADE-Adaptation, Adoption, De Novo Development (ADOLOPMENT) framework was employed to provide a structured and transparent methodology for healthcare decisions and recommendations.²⁵ This framework included the formulation of the public health question, review of relevant resources, assessment of the evidence and drawing conclusions for healthcare recommendations.

We structured the public health question from the perspective of healthcare providers with the aim to improve the metabolic and general health of children and adolescents in the Asia-Pacific region against the background of the increasing prevalence of metabolic morbidities in this population. The conclusions based on the judgements for all criteria in the assessments showed that they were in favour of the recommendations and the overall

evidence was at least moderately certain to support the recommendations. The full framework is included in online supplemental annex.

Additional considerations

National 24-hour integrated movement or activity guidelines were used as reference and these guidelines included the Canadian 24-hour movement guidelines for children and youth, the Australian 24-hour integrated movement guidelines for children and young people and the Singapore integrated 24-hour activity guidelines for children and adolescents.¹⁰⁻¹²

International and national guidelines for physical activity, sedentary behaviour, sleep or eating habits were used as reference and these guidelines included, but not limited to, the WHO guidelines on physical activity and sedentary behaviour,²⁶ the American Academy of Pediatrics policy on children, adolescents and the media,²⁷ the American Academy of Sleep Medicine consensus statement on recommended amount of sleep for paediatric populations²⁸ and the WHO guidelines on sugars intake for adults and children.²⁹

Limitations

The limitations of the methodology include the selection of only studies published in English language. There is a small chance that some evidence published from the Asia-Pacific region in another language may have been overlooked. However, it is unlikely that these studies would be sufficient to change the wording of the statements. Another limitation of the GRADE method is the tendency to downgrade epidemiological observational evidence. The recommended durations for MVPA and sleep are based on current international guidelines and/or consensus and more evidence on the precise dose-response relationship between these behaviours and healthy outcomes is needed.

Expert panel voting

The Asia Pacific Maternal and Child Metabolic Health Conference and Integrated Platform for Research in Advancing Metabolic Health Outcomes of Women and Children International Meeting brought together clinicians, nurses and allied healthcare professionals to discuss metabolic diseases, such as obesity and diabetes, for women and children in the Asia-Pacific region. The theme for 2021 conference was the promotion of beneficial lifestyle habits for good metabolic and general health for children and adolescents in the Asia-Pacific region. Members of the Asia Pacific Pediatric Association and Federation of Asia and Oceania Perinatal Societies were invited and there were representatives from 13 Asia-Pacific countries—Australia, China, Hong Kong, India, Indonesia, Japan, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

The consensus session was conducted on 9 January 2021 through a virtual meeting platform. All representatives were eligible to vote and comment on the recommendations. For the consensus process, each recommendation was presented and read, followed by the online voting of which, there were three responses—'Agree', 'Disagree' or 'I have comments'. Each representative was given one vote per recommendation and a majority in agreement was considered when there were 70% or more votes for 'Agree'. The voting results for each recommendation was shown immediately and representatives were invited to comment on the recommendation. If there was no majority in agreement (ie, 69% or less votes for 'Agree'), the representatives would vote again on the revised recommendation. This process would be repeated until there was a majority in agreement,

before proceeding to the next recommendation. All 10 revised recommendations achieved a majority in agreement (ie, received 70% or more votes for 'Agree').

CONSENSUS STATEMENTS

Statement 1

Children and adolescents should integrate the recommended physical activity, sedentary behaviour, sleep and eating habits within each 24-hour period for good physical, mental and social health

Supporting paragraph

Physical activity is vital for children and adolescents to grow and develop healthily.¹⁹ There are multiple benefits for children and adolescents who participate in regular physical activity, such as better aerobic fitness and body composition, improved musculoskeletal and mental health, lower metabolic risks and improved social health indicators.^{19 26 30 31} More evidence has shown that prolonged sedentary behaviour, especially unsupervised and excessive screen time, can have detrimental impact on the child's or adolescent's health, including unfavourable effects on pro-social behaviour.³²⁻³⁴ The quality and length of sleep also play an important role in metabolic health, as inadequate sleep is related to childhood obesity and hypertension.^{21 35 36} Adopting healthy eating habits and choosing nutritious foods and drinks supplies energy to support daily activities, growth and development. Eating habits and movement behaviours also closely influence each other in terms of energy balance. Therefore, the goal is to assimilate recommended amount of physical activity, limited sedentary behaviours, sufficient sleep duration and healthy eating habits to promote the best health outcomes in children and adolescents.³⁷⁻³⁹

Statement 2

Accumulate a daily average of 60 min or more of MVPA.

Supporting paragraph

Adequate levels of physical activity in children and adolescents have health benefits in the present and future.^{19 26} Some physical activity is better than none, and more activity is better than some activity. Emergent evidence suggests that higher levels of physical activity are associated with greater fitness and movement competencies.⁴⁰ The intensity of activities is important with strong evidence showing that MVPAs are beneficial for developing both health and skill-related fitness and movement competencies.^{19 26} Vigorous-intensity activities should be included whenever possible for additional health benefits.^{19 26} Physical activities for children and adolescents should be encouraged across different contexts—including at home, school and in the community. These activities could include active transportation (walking or cycling), household chores (washing or cleaning), recreational activities (active play or camping) and planned physical activities or sport programmes.^{41 42} Regular physical education lessons are a mandated part of the school curricula in many Asia-Pacific countries and, along with school-based extracurricular activities, can provide a regular opportunity for children and adolescents to participate in physical activity. Based on the WHO guidelines on physical activity and sedentary behaviour (2020), a daily average of 60 min of physical activity was adopted in response to more studies reporting an average of 60 min of physical activity for health benefits, as opposed to a daily minimum of 60 min.²⁶ Outdoor activities also provide sunlight exposure, which is high in most Asia-Pacific countries,

to increase levels of vitamin D. Replacing sedentary activity with light, moderate or vigorous physical activity on a daily basis is encouraged.^{40 43}

Statement 3

Engage in muscle and bone strengthening activities at least three times a week.

Supporting paragraph

Resistance or muscle and bone strengthening activities should be part of children's range of physical activities.^{26 41 42 44} These activities include movements that involve the carriage of body mass to an array of activities incorporating light weights or dynamic neuromuscular type activities such as jumping, skipping or hopping.^{44 45} Performing these activities under proper supervision (such as in physical education and school sport) and on a regular basis (eg, twice a week) in the period of child growth and development improves markers of health, enhances physical performance, improves physical literacy (movement skills) and reduces injury risk in children and adolescents.⁴⁵⁻⁴⁸ Learning and practising correct and safe resistance training principles under proper supervision, children and adolescents can improve muscle strength without a concomitant increase in muscle size or any negative impact on physical growth and development.⁴⁸

Statement 4

Engage in a variety of light-intensity physical activities as often as possible throughout the day.

Supporting paragraph

Light-intensity physical activities spanning from static (eg, standing) to dynamic activities (eg, slow walking) have shown health benefits.^{49 50} In regular daily routines, choose the more active option as much as possible, as every move counts. Active play over screen time, being outdoors rather than indoors, taking the stairs instead of the lift, are some everyday examples.⁵¹ Step counts using pedometers have been used to track population-based physical activity and also to provide a step count target to achieve the recommended amount of physical activity daily.⁵² Taking more steps per day is protective against obesity.⁵²

Statement 5

Take the necessary precautions when engaging in physical activity and seek medical help if you feel any discomfort.

Supporting paragraph

In order to sustain long-term participation in physical activity and sports, injuries must be minimised.⁵³ Hence safety is a key consideration in any physical activity and in organised sports. Warm-ups should be performed before being active. One should also perform cool-down stretching post activity. Proper hydration must be maintained.⁵⁴ Footwear and equipment must be appropriate for the physical activity or sport.⁵⁴ Take precautions when being active in hot and humid conditions, such as regular breaks to drink water. Whenever possible, avoid high temperatures and extremely humid outdoor conditions. One should be active in hazard-free areas and avoid uneven surfaces. In addition, one should apply protection against the sun and insects when physically active outdoors.^{55 56} The rules of the game must be fully understood and adhered to. There should be proper conditioning in the aspects of fitness, flexibility and strength.^{54 57} Proper form, technique and skills relevant to the game should be adopted.⁵⁴ Avoid focusing and specialising in a single sport at a

young age by participating in a variety of sports throughout the year.^{57 58}

Those with pre-existing medical conditions may need to consult a physician before participating in sports or physical activity.⁵⁶ Strenuous physical activities should be avoided when feeling unwell.^{55 56} Seek medical attention if one experiences persistent dizziness, palpitations, chest discomfort or breathlessness during or after physical activity.⁵⁹

Statement 6

Sedentary recreational screen time should be limited to 2 hours or less per day.

Supporting paragraph

Examples of recreational screen time activities include television viewing, electronic device use (eg, computer, tablet and phone) and playing physically inactive video games.^{27 60} Like all tools, screen time can be both a friend and foe, and one should always be mindful how to reap benefits and minimise harm from these devices. They should be embraced for educational purposes and used for appropriate amounts of rest and relaxation. Excessive sedentary recreational screen time has shown to be associated with a variety of health harms, both physical and psychoemotional, such as adiposity, depressive symptoms and quality of life.^{33 60 61} It also increases unhealthy dietary behaviours, which are significant risk factors for overall poor health.^{61 62} Providers should address this behaviour by examining the child's or adolescent's pattern of sedentary recreational time and then suggest parenting strategies on how to limit its use.^{27 33 63 64} Parents' behaviours are also important influencing factors.⁶²

Statement 7

Take regular movement breaks when there is prolonged sitting or inactivity.

Supporting paragraph

The 2020 WHO guidelines on physical activity and sedentary behaviour acknowledged that sedentary behaviour among children and adolescents bore detrimental effects on their fitness, adiposity and behaviour or sleep.⁶⁵ There will be times when children are required to remain seated for prolonged periods, such as for educational activities, during long-distance journeys or some cultural and social recreational activities. During the COVID-19 pandemic, additional screen-time during lessons and social interactions added to sedentary behaviours among children and adolescents.⁶⁶ Thus, while sedentary time cannot be completely eliminated, the inclusion of regular breaks to encourage frequent movement or physical activity, is imperative. In addition to contributing to a child's cumulative physical activity levels,⁶⁷ it is also beneficial for their mental and social health,³⁰ and activity breaks have been found to aid concentration during school lessons.⁶⁸ Although the breaks need not be very long, having a few minutes of regular movement for every 30–60 min of sedentary time, together with active physical play during break times should help reduce the negative impact of prolonged inactivity.⁶⁹ Indeed, encouraging play, rather than additional screen time during recreational time, is an important contributor to overall movement.

Statement 8

Have daily sleep of 9–11 hours (for 5–13 years old) and 8–10 hours (for 14–18 years old).

Supporting paragraph

Sleep is an integral element of mental and physical health, but children in many Asian countries go to bed too late and accumulate too little night-time sleep.^{70 71} According to the current evidence, adequate sleep duration is associated with better outcomes, including academic achievement, emotional regulation, well-being and mental health, while insufficient sleep increases the risk of accidents and injuries, obesity, diabetes, hypertension and depression.^{21 28 36 72} To promote optimal health, children aged 5–13 years should sleep 9–11 hours and adolescents aged 14–18 years should sleep 8–10 hours regularly in each 24-hour period.^{28 73} While some children may take naps in the day to accumulate the recommended duration of sleep, we would encourage achieving these recommendations through night-time sleep.

Statement 9

Take the recommended amounts of foods and drinks that are balanced and nutritious to support growth and daily activities.

Supporting paragraph

Nutrition recommendations for children should be specific to the population of interest, with the natural progression of increasing portions with age.⁷⁴ As the dietary choices of the individual and their families can be shaped by both social and ecological environments,^{74–76} the knowledge of child-specific dietary guidelines alone is insufficient in effecting behavioural change.⁷⁴ Deliberate selection of food and drinks, in appropriate quantity for the respective age, is integral to achieving a healthy eating habit so as to support the child's or adolescent's growth, development and activity.

Appropriate meal portions can be planned through incorporating key food groups on a plate, where half the plate comprises vegetables and fruits, a quarter being brown rice and grains, and a quarter being protein-rich food.^{77 78} A diverse range of foods from all food groups are required to fulfil nutrient requirements.^{76 78–80} Nutritionally balanced foods and drinks consist of items from major food groups (eg, whole grains; lean meats, poultry, seafood; vegetables, fruits, legumes) and choosing options with low saturated fat (eg, low-fat dairy products, foods prepared with limited solid fat and foods free of saturated and trans fats).^{79 81–83} To reduce the risk of adiposity and dental caries in children, the amount of added sugars in products that naturally contain sugars (eg, honey, fruit juices and concentrates) and in sugar-sweetened beverages should be limited to 10% or less of total energy intake.^{82–86} In consideration of further limiting free sugars to less than 5% of total energy intake per day as an extended recommendation by WHO,⁸⁵ alternative recommendations of limiting free sugars to not more than six teaspoons per day (approximately 25 g per day) have also been suggested.^{86 87}

Parents can set good examples during meal times and exert positive influence on the quality of their children's diet by having regular family eating habits.^{75 76 82} While there is a positive relationship between frequency of family meals and the consumption of nutrient-rich foods among children and adolescents, nutritional benefits may be negated depending on the type of foods provided by parents. Covert control of healthier food and drinks made available to children, coupled with an authoritative style of parenting, is associated with an improvement in eating behaviour and lower risk of obesity.⁷⁵ Furthermore, having a nutritious breakfast daily is strongly recommended as it has beneficial health benefits, such as a healthier body weight and better diet quality.^{76 80 82} A nutritious breakfast includes foods

from the major food groups with no added sugars (eg, whole grain bread with boiled eggs and milk, rolled oats with fresh fruit and yoghurt).⁷⁶ We encourage all readers to refer to local dietary guidelines for suggestions on sample meal plans for respective age groups.

Statement 10

Work towards meeting all the recommendations for physical activity, sedentary behaviour, sleep and eating habits for optimal health and development

Supporting paragraph

In order to achieve an overall improvement of health indicators in physical, mental and social health, it is imperative that more of the recommendations on physical activity, sedentary and sleep behaviours are met.^{88 89} Sedentary behaviour, unhealthy diet, lack of physical activity and sleep are modifiable risk factors associated with metabolic disease such as obesity, hypertension, raised lipids and raised glucose, which are associated with NCD. For the best health outcomes, children and adolescents should strive to meet all the recommendations.^{13 90–92}

All the recommendations are of comparable importance; attaining the same number of recommendations in any combinations (eg, high physical activity and low sedentary behaviour, high physical activity and adequate sleep, or low sedentary behaviour and adequate sleep) can deliver comparable health outcomes in terms of cardiometabolic health and adiposity.^{13 88 93 94}

Cultivating healthy lifestyle behaviours in children and adolescents in the Asia-Pacific involves, but is not limited to, creating a cultural change in society through provision of architectural support and improvement of health education literacy in the community. Fundamental to this is the family unit where parents and guardians hold authoritative roles. Parents and guardians are well suited to guide and encourage their children towards gradually implementing the recommendations into their lifestyle with an eventual goal of meeting all the recommendations, which will greatly reduce the burden of NCDs in adulthood. Healthy habits inculcated in childhood lay a sound foundation to a healthy adult.

CONCLUSION

The Asia-Pacific region is in a vulnerable position as the prevalence of NCDs will inevitably rise with the rapid socioeconomic transitions, yet it is ill prepared for this public health challenge as Asian children are among the least physically active when compared with the rest of the world. These guidelines provide the latest evidence-based recommendations towards a holistic approach for beneficial lifestyle activities and adopt a practical perspective by framing these activities within a 24-hour period. Furthermore, eating and dietary elements were included to complete the energy cycle. By investing in the younger generations through the advocacy for a healthier lifestyle, we aim to reduce the burden of NCDs on the health and social systems in this region. Aligned with the WHO's global strategy to control NCDs, prevention through health promotion is the most feasible approach.

SUMMARY

Statement 1

Children and adolescents should integrate the recommended physical activity, sedentary behaviour, sleep and eating habits within each 24-hour period for good physical, mental and social health

Statement 2

Accumulate a daily average of 60 min or more of MVPA.

Statement 3

Engage in muscle and bone strengthening activities at least three times a week.

Statement 4

Engage in a variety of light-intensity physical activities as often as possible throughout the day.

Statement 5

Take the necessary precautions when engaging in physical activity and seek medical help if you feel any discomfort.

Statement 6

Sedentary recreational screen time should be limited to 2 hours or less per day.

Statement 7

Take regular movement breaks when there is prolonged sitting or inactivity.

Statement 8

Have daily sleep of 9–11 hours (for 5–13 years old) and 8–10 hours (for 14–18 years old).

Statement 9

Take the recommended amounts of foods and drinks that are balanced and nutritious to support growth and daily activities.

Statement 10

Work towards meeting all the recommendations for physical activity, sedentary behaviour, sleep and eating habits for optimal health and development.

Collaborators The members of the consensus working group are: Australia - Senior Prof Anthony OKELY, University of Wollongong, New South Wales; China - Prof Feihong LUO, Children's Hospital, Fudan University, Shanghai; Germany - Assoc Prof Falk MÜLLER-RIEMENSCHNEIDER, Berlin Institute of Health, Berlin; Hong Kong - Assoc Prof Betty Wain Man BUT, Queen Elizabeth Hospital; India - Prof M.C.K. NAIR, Kerala University of Health Sciences, Kerala; Indonesia - Dr Aman Bakhti PULUNGAN, Indonesian Pediatric Society, Jakarta; Japan - Prof Ichiro MORIOKA, Nihon University, Tokyo; Assoc Prof Nobuhiko NAGANO, Nihon University, Tokyo; Malaysia - Assoc Prof Azriyanti ANUAR ZAINI, University of Malaya, Kuala Lumpur; Dr Thiyagar NADARAJAW, Hospital Sultanah Bahiyah, Kedah; Prof Muhammad Yazid JALALUDIN, University of Malaya, Kuala Lumpur; Myanmar - Dr Mya Sandar THEIN, Yangon Children Hospital, Yangon; Philippines - Dr Divina Cristy REDONDO-SAMIN, Premier Medical Center, Neuva Ecija; Singapore - Dr Benny Kai Guo LOO, KK Women's and Children's Hospital; Prof Kok Hian TAN, KK Women's and Children's Hospital; Assoc Prof Benedict TAN, Changi General Hospital; Prof Michael Yong Hwa CHIA, Nanyang Technological University; Dr Dinesh SIRISENA, Khoo Teck Puat Hospital; Mr Micheal LIM, KK Women's and Children's Hospital; Ms Ethel Jie Kai LIM, KK Women's and Children's Hospital; Dr Mohammad Ashik ZAINUDDIN, KK Women's and Children's Hospital; Dr Poh Chong CHAN, National University Hospital; Assoc Prof Ngai Chuan TAN, SingHealth Polyclinics; Dr Ratnaporn SIRIAMORNARP, SingHealth Polyclinics; Dr Jean Yin OH, KK Women's and Children's Hospital; Dr Oon Hoe TEOH, KK Women's and Children's Hospital; Dr Teresa TAN, National University Hospital; Prof Victor Samuel RAJADURAI, KK Women's and Children's Hospital; Dr Terry Chin Chye TEO, KK Women's and Children's Hospital; Dr Phaik Ling QUAH, KK Women's and Children's Hospital; Dr Natarajan PADMAPRIYA, National University of Singapore; Sri Lanka - Prof Sachith METTANANADA, University of Kelaniya, Kelaniya; Thailand - Dr Areekul AMORNRIWATANAKUL, Mahidol University, Bangkok; Assoc Prof Pongsak NOIPAYAK, Navamindradhiraj University, Bangkok; Vietnam - Dr Manh Nhi HUYNH, Hospital for Traumatology and Orthopedics, Ho Chi Minh; Dr Thuy Song Ha NGUYEN, University of Medicine Pham Ngoc Thach, Ho Chi Minh.

Contributors All authors are part of the consensus workgroup and contributed to the consensus statement. The manuscript was drafted by BKGL and reviewed by all coauthors. All authors approved the final manuscript.

Funding Integrated platform for research in advancing metabolic health outcomes of women and children (NMRC/CG/C008A/2017_KKH).

Competing interests None declared.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

ORCID iD

Benny Kai Guo Loo <http://orcid.org/0000-0001-6385-8520>

REFERENCES

- 1 Alwan A. *Global status report on noncommunicable diseases 2010*. World Health Organization, 2011.
- 2 Alwan A, Maclean DR, Riley LM, et al. Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries. *Lancet* 2010;376:1861–8.
- 3 World Health Organization. *Global action plan for the prevention and control of noncommunicable diseases 2013–2020*. World Health Organization, 2013.
- 4 World Health Organization. *The Asia-Pacific perspective: redefining obesity and its treatment*. 2001.
- 5 Khoo S, Morris T. Physical activity and obesity research in the Asia-Pacific: a review. *Asia Pac J Public Health* 2012;24:435–49.
- 6 Mazidi M, Banach M, Kengne AP, et al. Prevalence of childhood and adolescent overweight and obesity in Asian countries: a systematic review and meta-analysis. *Arch Med Sci* 2018;14:1185.
- 7 Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obes* 2006;1:11–25.
- 8 Müller AM, Khoo S, Lambert R. Review of physical activity prevalence of Asian school-age children and adolescents. *Asia Pac J Public Health* 2013;25:227–38.
- 9 Peltzer K, Pengpid S. Leisure time physical inactivity and sedentary behaviour and lifestyle correlates among students aged 13–15 in the association of Southeast Asian nations (ASEAN) member states, 2007–2013. *Int J Environ Res Public Health* 2016;13:217.
- 10 Tremblay MS, Carson V, Chaput J-P, et al. Canadian 24-hour movement guidelines for children and youth: an integration of physical activity, sedentary behaviour, and sleep. *Appl Physiol Nutr Metab* 2016;41:S311–27.
- 11 Australian Government Department of Health. Australian 24-hour movement guidelines for children and young people (5–17 years): an integration of physical activity, sedentary behavior, and sleep—research report. Available: <https://www1.health.gov.au/internet/main/publishing.nsf/Content/ti-5-17years> [Accessed Nov 2020].
- 12 Loo BKG, Tan B, Chia MYH. Singapore Integrated 24-hour Activity Guidelines for Children and Adolescents Study Group. The Singapore integrated 24-hour activity guidelines for children & adolescents. *College of Paediatrics & Child Health Singapore. Singapore Journal of Obstetrics & Gynaecology* 2021;52:18–28.
- 13 Saunders TJ, Gray CE, Poitras VJ, et al. Combinations of physical activity, sedentary behaviour and sleep: relationships with health indicators in school-aged children and youth. *Appl Physiol Nutr Metab* 2016;41:S283–93.
- 14 Rocha NP, Milagres LC, Longo GZ, et al. Association between dietary pattern and cardiometabolic risk in children and adolescents: a systematic review. *J Pediatr* 2017;93:214–22.
- 15 Mu M, Xu L-F, Hu D, Min MU, Li-Fa XU, Dong HU, et al. Dietary patterns and overweight/obesity: a review article. *Iran J Public Health* 2017;46:869.
- 16 Lissner L, Heitmann BL. Dietary fat and obesity: evidence from epidemiology. *Eur J Clin Nutr* 1995;49:79–90.
- 17 Astrup A, Buemann B, Western P, et al. Obesity as an adaptation to a high-fat diet: evidence from a cross-sectional study. *Am J Clin Nutr* 1994;59:350–5.
- 18 Tee ES, Nurliyana AR, Norimah AK, Karim NA, et al. Breakfast consumption among Malaysian primary and secondary school children and relationship with body weight status - Findings from the MyBreakfast Study. *Asia Pac J Clin Nutr* 2018;27:421–32.
- 19 Poitras VJ, Gray CE, Borghese MM, et al. Systematic review of the relationships between objectively measured physical activity and health indicators in school-aged children and youth. *Appl Physiol Nutr Metab* 2016;41:S197–239.

- 20 Carson V, Hunter S, Kuzik N, et al. Systematic review of sedentary behaviour and health indicators in school-aged children and youth: an update. *Appl Physiol Nutr Metab* 2016;41:S240–65.
- 21 Chaput J-P, Gray CE, Poitras VJ, et al. Systematic review of the relationships between sleep duration and health indicators in school-aged children and youth. *Appl Physiol Nutr Metab* 2016;41:S266–82.
- 22 Okely AD, Salmon J, Vella S. A systematic review to update the Australian physical activity guidelines for children and young people.
- 23 Guyatt GH, Oxman AD, Vist GE, et al. Grade: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;336:924–6.
- 24 Balshem H, Helfand M, Schünemann HJ, et al. Grade guidelines: 3. rating the quality of evidence. *J Clin Epidemiol* 2011;64:401–6.
- 25 Schünemann HJ, Wiercioch W, Brozek J, et al. Grade evidence to decision (ETD) frameworks for adoption, adaptation, and de novo development of trustworthy recommendations: GRADE-ADOLPMENT. *J Clin Epidemiol* 2017;81:101–10.
- 26 World Health Organization. *Who guidelines on physical activity and sedentary behaviour*. Geneva World Health Organization; 2020.
- 27 Council on Communications and Media. *Children, adolescents, and the media*. *Pediatrics* 2013;132:958–61.
- 28 Paruthi S, Brooks LJ, D'Ambrosio C, et al. Recommended amount of sleep for pediatric populations: a consensus statement of the American Academy of sleep medicine. *J Clin Sleep Med* 2016;12:785–6.
- 29 World Health Organization. *Guideline: sugars intake for adults and children*. World Health organization, 2015.
- 30 Janssen I, Leblanc AG. Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *Int J Behav Nutr Phys Act* 2010;7:1–6.
- 31 Strong WB, Malina RM, Blimkie CJR, et al. Evidence based physical activity for school-age youth. *J Pediatr* 2005;146:732–7.
- 32 Carson V, Janssen I, Volume JJ. Volume, patterns, and types of sedentary behavior and cardio-metabolic health in children and adolescents: a cross-sectional study. *BMC Public Health* 2011;11:11(1):1–0.
- 33 Tremblay MS, LeBlanc AG, Janssen I, et al. Canadian sedentary behaviour guidelines for children and youth. *Appl Physiol Nutr Metab* 2011;36:59–64.
- 34 Veitch J, van Stralen MM, Chinapaw MJM, et al. The neighborhood social environment and body mass index among youth: a mediation analysis. *Int J Behav Nutr Phys Act* 2012;9:1–9.
- 35 Fatima Y, Doi SAR, Mamun AA. Longitudinal impact of sleep on overweight and obesity in children and adolescents: a systematic review and bias-adjusted meta-analysis. *Obes Rev* 2015;16:137–49.
- 36 Sparano S, Lauria F, Ahrens W, et al. Sleep duration and blood pressure in children: analysis of the pan-European IDEFICS cohort. *J Clin Hypertens* 2019;21:572–8.
- 37 Vaivada T, Gaffey MF, Bhutta ZA. Promoting early child development with interventions in health and nutrition: a systematic review. *Pediatrics* 2017;140.
- 38 Petrie HJ, Stover EA, Horswill CA. Nutritional concerns for the child and adolescent competitor. *Nutrition* 2004;20:620–31.
- 39 Chaput J-P, Carson V, Gray CE, et al. Importance of all movement behaviors in a 24 hour period for overall health. *Int J Environ Res Public Health* 2014;11:12575–81.
- 40 Kidokoro T, Suzuki K, Naito H, et al. Moderate-to-vigorous physical activity attenuates the detrimental effects of television viewing on the cardiorespiratory fitness in Asian adolescents: the Asia-fit study. *BMC Public Health* 2019;19:1–8.
- 41 Chen P, Wang D, Shen H, et al. Physical activity and health in Chinese children and adolescents: expert consensus statement (2020). *Br J Sports Med* 2020;54:1321–31.
- 42 Health Promotion Board Singapore. *National physical activity Guidelines-Children and youth aged up to 18 years*. Available: https://www.academia.edu/10443994/National_Physical_Activity_Guidelines_for_Children_and_Youth [Accessed Nov 2020].
- 43 Sun Y, Yin X, Li Y, et al. Isotemporal substitution of sedentary behavior for physical activity on cardiorespiratory fitness in children and adolescents. *Medicine* 2020;99:e21367.
- 44 Faigenbaum AD, Kraemer WJ, Blimkie CJR, et al. Youth resistance training: updated position statement paper from the National strength and conditioning association. *J Strength Cond Res* 2009;23:560–79.
- 45 Behm DG, Faigenbaum AD, Falk B, et al. Canadian Society for exercise physiology position paper: resistance training in children and adolescents. *Appl Physiol Nutr Metab* 2008;33:547–61.
- 46 Lloyd RS, Faigenbaum AD, Stone MH, et al. Position statement on youth resistance training: the 2014 international consensus. *Br J Sports Med* 2014;48:498–505.
- 47 Bernhardt DT, Gomez J, Johnson MD, et al. Strength training by children and adolescents. *Pediatrics* 2001;107:1470–2.
- 48 Stricker PR, Faigenbaum AD, McCambridge TM, et al. Resistance training for children and adolescents. *Pediatrics* 2020;145.
- 49 Carson V, Ridgers ND, Howard BJ, et al. Light-Intensity physical activity and cardiometabolic biomarkers in US adolescents. *PLoS One* 2013;8:e71417.
- 50 Füzéki E, Engeroff T, Banzer W. Health benefits of Light-intensity physical activity: a systematic review of accelerometer data of the National health and nutrition examination survey (NHANES). *Sports Med* 2017;47:1769–93.
- 51 Tremblay MS, Gray C, Babcock S, et al. Position statement on active outdoor play. *Int J Environ Res Public Health* 2015;12:6475–505.

- 52 Tudor-Locke C, Craig CL, Cameron C, *et al.* Canadian children's and youth's pedometer-determined steps/day, parent-reported TV watching time, and overweight/obesity: The CANPLAY Surveillance Study. *Int J Behav Nutr Phys Act* 2011;8:66–0.
- 53 Brenner JS, Council on Sports Medicine and Fitness. Sports specialization and intensive training in young athletes. *Pediatrics* 2016;138.
- 54 Rössler R, Donath L, Verhagen E, *et al.* Exercise-based injury prevention in child and adolescent sport: a systematic review and meta-analysis. *Sports Med* 2014;44:1733–48.
- 55 Chen P, Mao L, Nassiss GP, *et al.* Returning Chinese school-aged children and adolescents to physical activity in the wake of COVID-19: actions and precautions. *J Sport Health Sci* 2020;9:322–324.
- 56 Virgilio SJ. National physical activity guidelines. *Teach Elem Phys Educ* 1999;10:21.
- 57 Bergeron MF, Mountjoy M, Armstrong N, *et al.* International Olympic Committee consensus statement on youth athletic development. *Br J Sports Med* 2015;49:843–51.
- 58 Merkel DL. Youth sport: positive and negative impact on young athletes. *Open Access J Sports Med* 2013;4:151.
- 59 Schmidt C, Borjesson M. Sudden cardiac death in athletes. *J Intern Med* 2014;275:93–103.
- 60 Tremblay MS, LeBlanc AG, Kho ME, *et al.* Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *Int J Behav Nutr Phys Act* 2011;8:1–22.
- 61 Stiglic N, Viner RM. Effects of screentime on the health and well-being of children and adolescents: a systematic review of reviews. *BMJ Open* 2019;9:e023191.
- 62 Pearson N, Griffiths P, Biddle SJH, *et al.* Clustering and correlates of screen-time and eating behaviours among young adolescents. *BMC Public Health* 2017;17:1–2.
- 63 Twenge JM, Campbell WK. Associations between screen time and lower psychological well-being among children and adolescents: evidence from a population-based study. *Prev Med Rep* 2018;12:271–83.
- 64 Schmidt ME, Haines J, O'Brien A, *et al.* Systematic review of effective strategies for reducing screen time among young children. *Obesity* 2012;20:1338–54.
- 65 Bull FC, Al-Ansari SS, Biddle S, *et al.* World Health organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med* 2020;54:1451–62.
- 66 Kovacs VA, Starc G, Brandes M, *et al.* Physical activity, screen time and the COVID-19 school closures in Europe - An observational study in 10 countries. *Eur J Sport Sci* 2021:1–10.
- 67 Drummy C, Murtagh EM, McKee DP, *et al.* The effect of a classroom activity break on physical activity levels and adiposity in primary school children. *J Paediatr Child Health* 2016;52:745–9.
- 68 Ma JK, Le Mare L, Gurd BJ. Classroom-Based high-intensity interval activity improves off-task behaviour in primary school students. *Appl Physiol Nutr Metab* 2014;39:1332–7.
- 69 McManus AM. Physical activity - a neat solution to an impending crisis. *J Sports Sci Med* 2007;6:368.
- 70 Gradisar M, Gardner G, Dohnt H. Recent worldwide sleep patterns and problems during adolescence: a review and meta-analysis of age, region, and sleep. *Sleep Med* 2011;12:110–8.
- 71 Chen B, Bernard JY, Padmapriya N, *et al.* Socio-Demographic and maternal predictors of adherence to 24-hour movement guidelines in Singaporean children. *Int J Behav Nutr Phys Act* 2019;16:1.
- 72 Dutil C, Chaput J-P. Inadequate sleep as a contributor to type 2 diabetes in children and adolescents. *Nutr Diabetes* 2017;7:e266.
- 73 Hirshkowitz M, Whitton K, Albert SM, *et al.* National sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health* 2015;1:40–3.
- 74 Hollis JL, Collins CE, DeClerck F, *et al.* Defining healthy and sustainable diets for infants, children and adolescents. *Glob Food Sec* 2020;27:100401.
- 75 Scaglioni S, De Cosmi V, Ciappolino V, *et al.* Factors Influencing Children's Eating Behaviours. *Nutrients* 2018;10:706.
- 76 Wellington Ministry of Health (2012). Food and nutrition guidelines for healthy children and young people (aged 2–18 years): a background paper, 2015. Available: <https://www.health.govt.nz/publication/food-and-nutrition-guidelines-healthy-children-and-young-people-aged-2-18-years-background-paper> [Accessed Nov 2020].
- 77 Health Hub Ministry of Health Singapore. Healthy food for kids and teens. Available: <https://www.healthhub.sg/live-healthy/578/A%20Healthy%20Food%20Foundation%20-%20for%20Kids%20and%20Teens> [Accessed Nov 2020].
- 78 U.S. department of health and human services and U.S. department of agriculture (2015). 2015–2020 dietary guidelines for Americans. 8th edition, 2015. Available: <https://health.gov/our-work/food-nutrition/2015-2020-dietary-guidelines/guidelines/> [Accessed Nov 2020].
- 79 National Health and Medical Research Council. Australian dietary guidelines, 2013. Available: https://www.eatforhealth.gov.au/sites/default/files/content/n55_austrian_dietary_guidelines.pdf [Accessed Nov 2020].
- 80 Monzani A, Ricotti R, Caputo M, *et al.* A systematic review of the association of skipping breakfast with weight and cardiometabolic risk factors in children and adolescents. what should we better investigate in the future? *Nutrients* 2019;11:387.
- 81 Wang DD, Li Y, Chiuve SE, *et al.* Association of specific dietary fats with total and cause-specific mortality. *JAMA Intern Med* 2016;176:1134–45.
- 82 National Institute for Health and Care Excellence United Kingdom. Guideline: preventing excess weight gain, 2015. Available: <https://www.nice.org.uk/guidance/ng7> [Accessed Nov 2020].
- 83 World Cancer Research Fund. Diet, nutrition and physical activity: energy balance and body fatness, 2018. Available: <https://www.wcrf.org/dietandcancer/energy-balance-body-fatness> [Accessed Nov 2020].
- 84 Quah PL, Kleijweg J, Chang YY, *et al.* Association of sugar-sweetened beverage intake at 18 months and 5 years of age with adiposity outcomes at 6 years of age: the Singapore GUSTO mother-offspring cohort. *Br J Nutr* 2019;122:1303–12.
- 85 World Health Organisation. Guideline: sugars intake for adults and children, 2015. Available: <https://www.who.int/publications/i/item/9789241549028> [Accessed Nov 2020].
- 86 Vos MB, Kaar JL, Welsh JA, *et al.* Added sugars and cardiovascular disease risk in children: a scientific statement from the American heart association. *Circulation* 2017;135:e1017–34.
- 87 National Health Services United Kingdom. Sugar: the facts. Available: [https://www.nhs.uk/live-well/eat-well/how-does-sugar-in-our-diet-affect-our-health/#:~:text=Adults%20should%20have%20no%20more,day%20\(5%20sugar%20cubes\)](https://www.nhs.uk/live-well/eat-well/how-does-sugar-in-our-diet-affect-our-health/#:~:text=Adults%20should%20have%20no%20more,day%20(5%20sugar%20cubes)) [Accessed Nov 2020].
- 88 Janssen I, Roberts KC, Thompson W. Is adherence to the Canadian 24-hour movement behaviour guidelines for children and youth associated with improved indicators of physical, mental, and social health? *Appl Physiol Nutr Metab* 2017;42:725–31.
- 89 Sampasa-Kanyinga H, Standage M, Tremblay MS, *et al.* Associations between meeting combinations of 24-h movement guidelines and health-related quality of life in children from 12 countries. *Public Health* 2017;153:16–24.
- 90 Hjorth MF, Chaput J-P, Damsgaard CT, *et al.* Low physical activity level and short sleep duration are associated with an increased cardio-metabolic risk profile: a longitudinal study in 8–11 year old Danish children. *PLoS One* 2014;9:e104677.
- 91 Carson V, Chaput J-P, Janssen I, *et al.* Health associations with meeting new 24-hour movement guidelines for Canadian children and youth. *Prev Med* 2017;95:7–13.
- 92 Chaput J-P, Dutil C. Lack of sleep as a contributor to obesity in adolescents: impacts on eating and activity behaviors. *Int J Behav Nutr Phys Act* 2016;13:1–9.
- 93 Dalene KE, Anderssen SA, Andersen LB, *et al.* Cross-Sectional and prospective associations between physical activity, body mass index and waist circumference in children and adolescents. *Obes Sci Pract* 2017;3:249–57.
- 94 Huang WY, Wong SH-S, He G, *et al.* Isotemporal substitution analysis for sedentary behavior and body mass index. *Med Sci Sports Exerc* 2016;48:2135.