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Physical activity and health in Chinese children and adolescents: expert consensus statement (2020)

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ABSTRACT

China is experiencing significant public health challenges related to social and demographic transitions and lifestyle transformations following unprecedented economic reforms four decades ago. Of particular public health concern is the fourfold increase in overweight and obesity rates in the nation's youth population, coupled with the low prevalence of adolescents meeting recommended levels of physical activity. Improving the overall health of China's more than 170 million children and adolescents has become a national priority. However, advancing nationwide health initiatives and physical activity promotion in this population has been hampered by the lack of a population-specific and culturally relevant consensus on recommendations for achieving these ends. To address this deficiency and inform policies to achieve *Healthy China 2030* goals, a panel of Chinese experts, complemented by international professionals, developed this consensus statement. The consensus was achieved through an iterative process that began with a literature search from electronic databases; in-depth reviews, conducted by a steering committee, of the resulting articles; and panel group evaluations and discussions in the form of email correspondence, conference calls and written communications. Ultimately, the panel agreed on 10 major themes with strong scientific evidence that, in children and adolescents aged 6–17, participating in moderate to vigorous physical activities led to multiple positive health outcomes. Our consensus statement also (1) highlights major challenges in promoting physical activity, (2) identifies future research that addresses current knowledge gaps, and (3) provides recommendations for teachers, education experts, parents and policymakers for promoting physical activity among Chinese school-aged children and adolescents. This consensus statement aligns with international efforts to develop global physical activity guidelines to promote physical activity and health and prevent lifestyle-related diseases in children and adolescents. More importantly, it provides a foundation for developing culturally appropriate and effective physical activity interventions, health promotion strategies and policy initiatives to improve the health of Chinese children and adolescents.

INTRODUCTION

In response to the *Healthy China 2030 Action Plan* and the rising epidemic of paediatric obesity and physical inactivity, leaders from the Shanghai University of Sport, school physical education

teachers, academic researchers, clinicians in paediatrics and administrators in public health and education representing six Chinese provinces, major municipalities and China's central government worked through an iterative process to reach an accord on building scientific consensus on physical activity and health in Chinese children and adolescents. These experts developed and finalised this physical activity and health consensus statement, which is the very first of its kind for children and adolescents in China. More importantly, the statement also provides impetus for school educators, community leaders, paediatric care providers and policymakers to develop culturally relevant school, clinical and community-based interventions and physical activity promotion strategies aimed at increasing physical activity and fitness and reducing the rapidly growing obesity crisis and other physical inactivity-induced disease risks among Chinese children and adolescents.

BACKGROUND, SIGNIFICANCE AND RATIONALE

Evidence from scientific research has consistently shown that physical activity is both important and beneficial for children and adolescents if they are to maintain and improve their health. Research indicates that those who are physically active show or report better overall physical and mental health, a higher level of fitness and a lower level of obesity than their sedentary or physically inactive counterparts^{1–4} and that an active level of physical activity or healthy aerobic fitness during early childhood is likely to be associated with better health outcomes in adulthood.⁵ Despite the major health benefits that can be derived from regular physical activity, the prevalence globally of children and adolescents performing activities that lead to aerobic conditioning, muscle strengthening, bone building and brain function improvement, as well as the reduction of stress and depression, remains low,^{6,7} and a large proportion of children and youth, including those living in low and middle-income countries, are either sedentary or not achieving recommended levels of physical activity.^{8–11}

Given decades of rapid economic, social, demographic and lifestyle transformations, China has followed global trends in exhibiting low levels of physical activity among its youth population. The overall level of physical activity and fitness among the nation's school-aged children and adolescents has been shown to be insufficient¹² and far from



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ideal from the perspective of public health and disease prevention.¹³ Evidence from large-scale cross-sectional and retrospective population studies reveals some startling results in China: less than a quarter (22%) of school students engage in any type of daily physical activity that lasts 60 min or more,¹⁴ with a general downward trend¹⁵; 85.8% engage in sedentary behaviours longer than 2 hours per day,¹⁶ leading to a decline in physical fitness,¹⁷ with only 3 in 10 students achieving an 'excellent' or 'good' rating in national physical fitness standards¹⁸; and only 15%–34% meet recommended physical activity guidelines.^{11 19 20} Overall, there is an extremely low prevalence (0.5%) of ideal cardiovascular health as reflected by seven health metrics, namely smoking, body mass index (BMI), dietary intake, physical activity, blood pressure, blood glucose and total cholesterol.²¹

The persistent trend in low levels of physical activity and achievement in meeting physical fitness standards among Chinese children and adolescents has been accompanied by a high prevalence of sedentary behaviours exhibited outside school environments, a situation made worse by excess dietary calorie intake, and has contributed to an associated epidemic of obesity. Nationally, between 2016 and 2017, 35%–37% of children and adolescents reported spending more than 2 hours per day on electronic screens (ie, the amount of time spent interacting with TVs, computers, smartphones, digital tablets and video games),^{20 22} and, more seriously, between 1995 and 2014, this youth population saw a fourfold increase in overweight and obesity, with around 1 in 5 children and adolescents being either overweight or obese.²³ This time period coincides with an increased globalisation of China and reflects changes in food availability and electronic media, both of which contribute to overweight, obesity and sedentary behaviours. It is projected that the prevalence of childhood overweight and obesity will reach 28% (or 49.5 million children) by 2030.²⁴ This epidemic of obesity, if it continues and no preventive measures are taken, will raise serious public health concerns because school-aged children and adolescents who have high BMIs and excessive body weights are known to be at high risk of developing other health problems, including cardiovascular, metabolic and musculoskeletal diseases,²⁵ as well as depression.²⁶

Despite the importance of regular physical activity and compelling evidence from the growing body of scientific literature regarding its health benefits for children and adolescents, there has been a lack of research-driven, evidence-based, culturally relevant consensus on physical activity and health in China. The absence of this may hinder the nation's public health efforts in preventing chronic diseases and promoting healthy growth for millions of Chinese children and adolescents. This population also bears the mounting health burden of non-communicable disease risk factors,^{27–29} has a high prevalence of depressive symptoms or major depressive disorders^{30–32} and experiences high expectations and pressure in achieving academic excellence^{33 34} that is both culturally embedded and potentially health debilitating. If not addressed in a timely way, this crisis will undermine China's target goal of having 50% of its youth achieve 'excellent' performance in physical fitness by 2022 and 60% by 2030.³⁵

This consensus statement is therefore aimed at narrowing the significant gaps in our current knowledge, addressing the need for better strategic policies and providing impetus for public health and research that will revive China's efforts in promoting physical activity and fitness among children and adolescents. Our aim aligns with the international effort to develop guidelines on physical activity and sedentary behaviours for children

and adolescents^{36–38} and contributes to the global efforts in promoting physical activity among youth populations as a primary preventive measure for combatting non-communicable diseases, including childhood obesity.

The consensus includes an overview of the current national and international physical activity guidelines for young people³⁹ that serve as a principal premise for the consensus, including those issued by the WHO and other leading countries. This overview is followed by a description of the objectives and processes from which the current consensus was developed. The paper then organises the consensus into major themes linking physical activity with health in child and adolescent populations. It also describes (A) practical challenges and barriers inherent in promoting physical activity in China, (B) research needs and gaps, (C) major public health messages, and (D) the significance of this accord as part of international efforts in reducing sedentary behaviours and increasing physical activity among school-aged children and adolescents. It concludes with a call for the development of effective evidence-based, culturally appropriate policies and interventions for Chinese children and adolescents.

PHYSICAL ACTIVITY GUIDELINES

Current international guidelines^{40–44} on physical activity for children and adolescents (age range: 5–17 years) generally recommend an active lifestyle and encourage participation in daily physical activity, including both light-intensity and moderate to vigorous-intensity physical activities, with the latter intensity being commonly recommended because it is more favourably related to a variety of health outcomes in children and youth.^{1 2}

Key guidelines include the following:

- ▶ Aerobic physical activity: Most of the 60 min or more per day should be either moderate-intensity or vigorous-intensity aerobic physical activity and should include vigorous-intensity physical activity at least 3 days a week.
- ▶ Muscle-strengthening physical activity: As part of their 60 min or more of daily physical activity, children and adolescents should include muscle-strengthening physical activity at least 3 days a week.
- ▶ Bone-strengthening physical activity: As part of their 60 min or more of daily physical activity, children and adolescents should include bone-strengthening physical activity at least 3 days a week.

Guidelines recommend that the amount of physical activity be greater than 60 min if additional health benefits are to be gained. Current guidelines also emphasise the need for creating physical activities that are age appropriate for children and adolescents, enjoyable and varied.⁴⁵ As research continues, new paradigms related to activity and health are emerging. For example, the Canadian 24-Hour Movement Guidelines^{42 46} have been proposed that integrate the balance of time spent per day in light to vigorous-intensity physical activity, sedentary behaviours and sleep to enhance health outcomes in those aged 5–17 years.

However, motivation and compliance for actively engaging in (or changing) health-related behaviours are significantly impacted by sociocultural standards and traditions. Although the science underlying current guidelines may be compelling, generally it has been derived from a narrow set of populations (primarily North American and European) and it is unlikely to drive wide-scale changes in activity behaviour in other cultures. Thus, it is critically important for public health and physical education agencies developing activity and health guidelines for China to fully recognise that science filtered through cultural considerations is fundamental for any implementation to be

effective. Finally, following the same reasoning, the outcomes of any activity and health-focused guidelines for China must parallel the targets outlined in the national policy *Healthy China 2030*.

OBJECTIVES AND PROCESS OF CONSENSUS DEVELOPMENT

Objectives

The objective of this paper is to develop an evidence-based, best-practices consensus aimed at promoting physical activity among Chinese school-aged children and adolescents between the ages of 6 and 17 years.⁴⁷ This objective supports the *Healthy China 2030 Action Plan*³⁵ and creates a scientific foundation for designing and developing culturally appropriate and population-specific guidelines, initiatives, interventions and strategies that can be used by schools, families, clinics and communities to increase physical activity and improve physical fitness among this youth population.

Panel of experts and consensus process

A steering committee (n=4) was formed that was tasked with (A) conducting a literature search and review on physical activity and health for children and adolescents; (B) identifying key topic areas to be considered in the consensus; and (C) drafting the initial consensus. The consensus was then reviewed by an expanded panel of experts (n=16) who were carefully selected to balance experience and expertise in the areas of public health, physical activity, epidemiology, physical fitness, physical education, paediatrics and exercise physiology, and to ensure diversity in themes and viewpoints in the statement. Systematic reviews were used as primary literature sources when available (see below). The writing group engaged in frequent email exchanges, conference calls, reviews of the literature and written communications. From this background work, an initial version of the consensus statement was drafted by the working committee and subsequently shared with panel members and an extended group of international experts in the field of physical activity and sports. The final version of the consensus document was developed based on input and comments from all participating members.

Physical activity and physical activity intensity defined

Consistent with the general public health model of promoting physical activity, which is defined as any bodily movement produced by skeletal muscles that requires energy expenditure,^{3 48} the consensus focused on the health benefits of regular physical activity, which, by definition, includes structured and unstructured forms of physical activity, as well as leisure, sports and transport activities, conducted in settings both in school and outside school.

Physical activity intensity refers to the activity's metabolic equivalent (MET), a term used to represent the rate of energy expenditure required to perform any physical activity.³ A MET is defined as the ratio of an activity-specific metabolic rate to the estimated resting metabolic rate (RMR; the energy the body needs to function while at rest). The absolute amount of energy expended to complete a physical task is a function of the type and intensity of an activity. In child and adolescent populations, the energy cost of an activity also varies with age and maturation status. Accordingly, MET values in youth are referred to a youth MET, which represents MET values specific to a given age group.⁴⁹ Currently, the precise MET_y intensity cut-points in energy expenditure have not been operationally defined. Based on using the RMR as a baseline MET value, intensity can be

classified into: sedentary behaviours (≤ 1.50 MET_y for activities such as reading, internet, TV and board games); light-intensity physical activity (1.51–2.99 MET_y for activities such as active video games, quiet school work and slow walking); moderate-intensity physical activity (3.00–5.99 MET_y for activities such as callisthenics, household chores and volleyball); and vigorous-intensity physical activity (≥ 6.00 MET_y for activities such as cycling, running, soccer and basketball).⁵⁰ (For the comprehensive list of activities and their associated MET_y for children and youth aged 6–18 years, visit www.nccor.org/tools-youthcompendium.)

Sources of evidence

The themes in the consensus statement are drawn from a wide range of research articles gathered from the fields of epidemiology, medicine, physiology, neuroscience and sociopsychology. The collection of these articles, both in English and Chinese, was based on an extensive electronic search of the literature using the following databases: EBSCO (Academic Search Complete, CINAHL Plus, MEDLINE, PsycINFO, SportDISCUS), CNKI, PubMed, Cochrane Library, EMBASE, SinoMed and Web of Science. No restrictions were imposed with regard to publication date. The consensus statement was developed using an expert consensus development approach involving group decision-making according to guidelines and other guideline documents⁵¹ (eg, expert consensus statements) published by national and international authorities (eg, WHO), as well as peer-reviewed literature.

Using their best judgement, the steering committee members selected individual studies, systematic reviews, consensus statements and meta-analyses that provided the best evidence available on the topic. Major individual research studies included those using cross-sectional, short and long-term population-based observational and/or prospective designs and randomised controlled intervention designs that involved school-aged children and adolescents, recognising the strengths and limitations of each of the research strategies. Studies on children with chronic disease conditions or disabilities were excluded. The main search was conducted on 1 January 2019, and the latest search was performed on 25 February 2020 (see online supplementary file). The search from the electronic databases resulted in a total of 17851 potential articles. On screening for relevance, 81 articles were included in this consensus.

Themes

The resulting consensus statement presents the panel's consensus reached on the effects and associations of physical activity on multiple health outcomes in children and adolescents, including cardiovascular fitness, brain health, physical and mental health and academic achievement. The statement also presents the panel's consensus on various individual factors, socioeconomic status, the built environment and physical factors, intervention strategies and risk of injuries from participation in physical activities that have been shown to impact or influence physical activity levels or health in the youth population.

STATEMENTS

Theme 1: overall health

1. An average of at least 60 min of moderate-intensity physical activity per day promotes the overall health of children and adolescents. Being physically active is essential because it contributes to the physical, cognitive, social and emotional well-being of children and adolescents^{3 52 53} and increases the

odds that they will stay physically active and healthy during adulthood.^{54 55}

2. In contrast, being sedentary or engaging only in light-intensity physical activity can contribute to the development of adverse health conditions among children and adolescents^{3 56}; low cardiorespiratory and muscular fitness; insulin resistance and type 2 diabetes; low bone mass, bone structure and bone strength; and an increased risk of cardiovascular disease, including hyperlipidaemia (eg, high levels of triglyceride) and high blood pressure. With excess calorie intake, it can also lead to a positive energy balance⁵⁷ contributing to overweight and obesity, which are risk factors for type 2 diabetes.
3. A high level of physical activity and cardiorespiratory fitness in childhood may play an important role in protecting health later in life.⁵

Theme 2: cardiorespiratory fitness and health

1. Adolescents who have low levels of cardiorespiratory fitness have an increased risk of cardiovascular diseases (ie, high cholesterol, low high-density lipoprotein cholesterol, impaired glucose levels, increased prevalence of metabolic syndrome) in comparison to moderately fit and highly fit adolescents. In addition, adolescents who have low levels of cardiorespiratory fitness and positive energy balance are more likely to be overweight or obese compared with those with moderate or high levels of cardiorespiratory fitness.⁵⁸
2. Children and adolescents who engage in moderate to vigorous-intensity physical activity have better cardiometabolic health (ie, systolic blood pressure, lipoprotein, glucose and insulin levels) independent of the amount of their sedentary time.⁵⁹
3. There is evidence to suggest that children and adolescents having high levels of cardiorespiratory fitness have improved cardiovascular risk outcomes, including lower BMI, waist circumference and body fat, as well as a prevalence of metabolic dysregulation in later life.⁶⁰
4. There is evidence to suggest that by replacing sedentary time and/or light-intensity physical activity with moderate to vigorous-intensity physical activity, children and adolescents may lower cardiometabolic risk factors, including waist circumference, systolic blood pressure, fasting high and low-density lipoprotein cholesterol, triglycerides, insulin and glucose.⁶¹
5. There is evidence indicating that children and adolescents with overweight and obesity benefit from exercise interventions because these interventions improve their cardiometabolic and vascular health, cardiorespiratory fitness⁶² and motor skill development.⁶³

Theme 3: musculoskeletal fitness and health

1. During childhood and adolescence, it is necessary to engage in weight-bearing physical activities, such as running and jumping, in order to attain peak bone mass and maintain healthy bone mineral accrual.⁶⁴⁻⁶⁷
2. A handful of exercise intervention studies (n=11) indicates that moderate to high-impact activities (jumping, load bearing, resistance and ball game activity) performed at least 3 days a week can have a modest effect on bone mineral density.^{68 69}
3. Children and adolescents with better muscular fitness (eg, gained through exercises involving hand grip, standing, long jump and sit-ups) were shown to have better health outcomes

(ie, lower levels of BMI and body fat, improvement in insulin resistance and lower levels of cardiovascular disease risk) in later life.⁶⁸

Theme 4: brain, cognition and academic achievement

1. Being physically active and physically fit is positively associated with brain structure and function in children with high cardiorespiratory fitness levels (as shown in higher VO₂max). These children demonstrate larger brain volumes in the areas involved with memory and executive function and better memory task performance compared with children with low fitness levels.⁷⁰
2. There is a positive association between physical activity (both moderate to vigorous-intensity physical activity and vigorous-intensity physical activity) and physical fitness and academic performance in children and adolescents.⁷¹⁻⁷⁴
3. There is evidence that physical activity interventions, including those of moderate to vigorous intensity, improve brain structure and function as well as cognitive and academic performance.⁷⁵⁻⁷⁹ However, a recent meta-analysis of high-quality intervention studies shows strong evidence for the beneficial effects of physical activity on math performance but inconclusive evidence on the beneficial effects of physical activity interventions on cognition and overall academic performance in children.⁸⁰
4. Engagement in moderate to vigorous-intensity physical activity both on weekdays and on weekends is associated with better academic performance among Chinese primary school students.⁸¹

Theme 5: overweight and obesity

1. The findings are inconsistent on the association between physical activity and overweight/obesity independent of calorie intake. Overall, evidence indicates no association or weak to modest association between physical activity and obesity,^{2 82-84} with no clear association reported in reviews of early prospective studies.⁸³ There is a moderate negative association between walking, measured by pedometers, and decreased adiposity⁸⁵ and between skill building and game-based activities and body composition.⁸⁶ The association with overweight/obesity tends to be stronger when moderate to vigorous-intensity physical activities are performed.² Among physical activity interventions, the effects of physical activity independent of dietary changes on measures indicative of weight reduction (eg, BMI, total fat, abdominal fat) tend to be in the small range.²
2. There is insufficient evidence to draw firm conclusions on whether either school or community-based interventions employing low to vigorous intensities of physical activity are effective for preventing obesity.
3. Among children and adolescents who are either overweight or obese, evidence suggests that exercise interventions (without dietary change) may have desirable effects on body composition (body mass, BMI, central obesity and fat mass). Additionally, benefits of exercise interventions have been shown for cardiometabolic and vascular health as well as cardiorespiratory fitness.⁸⁵
4. There is consensus that regular engagement in traditional sports, mainly football, may be as effective as general interventions based on physical activity for improving body composition and decreasing metabolic complications in children with obesity and may be appropriate, as a preventive intervention, for paediatric obesity treatment.^{86 87}

- There is evidence that elevated physical fitness in children and adolescents is associated with lower central obesity,^{88 89} an independent risk factor for cardiovascular-related diseases in adulthood. There is also some preliminary evidence that children (5–12 years old) following a year-round school calendar may benefit from experiencing less weight gain.⁹⁰

Theme 6: physical and mental health

- There is evidence that physical activity is associated with better mental health whereas sedentary behaviours (such as screen time) are associated with poorer mental health among children and adolescents.^{56 91–93} Domains of mental health include depression, stress, negative affect, psychological distress, self-image/self-esteem, satisfaction with life and happiness levels, and psychological well-being. Associations between physical activity and mental health outcomes, however, are generally weak in terms of effect sizes.

Theme 7: individual perceptions and influences of significant others

- A host of perceived psychological factors impact the physical activity behaviours of children and adolescents.⁹⁴ Among many salient factors, children and adolescents who have high levels of perceived competence, self-efficacy and access to physical activity/sports/recreational facilities are likely to participate in physical activity.^{95 96}
- Encouragement and modelling by peers, friends and parents are factors that motivate children and adolescents to participate in physical activity or achieve recommended levels of physical activity.^{97–104}
- There is some evidence to suggest that when parents reduce their own sedentary behaviours (including screen time), their children may decrease their screen time.¹⁰⁵
- Evidence from China indicates that there is a positive association between various forms of parental support, including parental encouragement, accompaniment, financial support, involvement, and role modelling, and high levels of physical activity participation among children and adolescents.^{106–108}

Theme 8: socioeconomic status, physical environment, built environment and policy influences

- There is consistent evidence of various environmental influences on the physical activity levels of children and adolescents.^{109–112} Commonly reported factors influencing physical activity levels include socioeconomic status (income and education), the physical environment (ambient air and water) and the built environment (neighbourhood design, parks and recreational facilities, green space, safety, access to physical activity facilities and street connectivity).
- Evidence from China indicates that built environmental features in the community, such as availability and accessibility of open space, recreational facilities and walkable sidewalks, are likely to facilitate increased physical activity and active commuting, as well as reduced sedentary behaviours among Chinese children and adolescents. In contrast, features such as the lack of bike lanes and high residential density are likely to be associated with childhood overweight and obesity.¹⁰⁹
- Survey data indicate that school support for physical activity is important for promoting and facilitating moderate to vigorous-intensity physical activity among Chinese children and adolescents. In addition, availability of local community-based sports clubs and organisations and convenient access to physical activity facilities are also per-

ceived as important resources for participating in moderate to vigorous-intensity physical activity among children and adolescents.¹¹³

- There is some indication that a low level of public awareness and perceived impact exists among schoolchildren and adolescents, their parents and school staff regarding existing governmental policies and initiatives relating to physical activity.¹¹⁴
- There is no clear evidence from China to suggest that socioeconomic status (eg, family socioeconomic status, parental education) is associated with levels of physical activity among Chinese children and adolescents.¹⁰⁶

Theme 9: interventions that promote physical activity in different settings

- There is some evidence that intervention strategies based at the school, home/family or community/neighbourhood level can increase physical activity in children and adolescents.^{115–120} School-based interventions that involve parents also have the potential to improve children's weight status, physical activity levels and sedentary behaviours.¹¹⁸ However, the effects of interventions using accelerometers to increase the overall physical activity of children and adolescents are generally reported to be negligible or small for moderate or vigorous-intensity physical activity interventions, regardless of age, BMI (overweight/obese) or implementation setting (home/family or school).¹¹⁹
- In China, there is preliminary evidence that a policy-driven, multicomponent, school-based physical activity intervention may have the potential to increase physical activity and prevent the development of obesity in Chinese children.¹²¹ In addition, synthesised evidence on school-based interventions for preventing obesity among Chinese school-aged children suggests that comprehensive interventions involving physical activity and health education may be more effective than physical activity alone.¹²²

Theme 10: risk of injuries from participating in physical activities

- There is some risk of injuries or overuse injuries among children and adolescents who participate in physical activities and sports,¹²³ as well as organised and unorganised leisure-time physical activity,^{1 2} with the evidence suggesting high numbers of injuries when participating in sports-related activities,¹²⁴ unorganised activities¹²⁵ and high-risk sports (eg, ice hockey).¹²⁶ In general, as the level of physical activity increases, the likelihood of injury increases.²
- In China, limited data indicate that injury risk is related to physical activity, with a high prevalence of activity-related injuries reported by boys and junior high students.^{127 128} In addition, a high prevalence of injuries is also reported by those who participate in team sports, have lower safety awareness, exercise in slippery conditions, overextend their play,¹²⁷ have excessive workout loads and do not warm up sufficiently.¹²⁸

CAVEATS

Panel experts are cognisant of the following caveats inherent in this consensus:

- Due to the limited number of high-quality Chinese-based studies and the paucity of research in certain areas of health, evidence for this consensus was drawn primarily from international studies that were predominantly based on Caucasian populations.

2. Consensus statements are based on the panel's best judgement regarding the current state of the art of research rather than on a quantitative synthesis (eg, a meta-analysis) of empirical data. Future updates of the consensus should consider the use of the Grading of Recommendations Assessment, Development and Evaluation process model as a more stringent approach in evaluating studies, assessing the quality of the evidence and making guidelines/recommendations for systematic reviews and guidelines. Such an approach has become common in recent years in the field of physical activity.^{39 129 130}
3. The consensus focuses primarily on Chinese school-aged children and adolescents without disabling conditions; it does not therefore offer any consensus related to physical activity for children and adolescents with physical disabilities.
4. This is a consensus on physical activity. However, the panel recognises the importance of children and adolescents having a healthy diet, balanced dietary behaviours and physically active lifestyle for healthy growth, lifelong well-being and obesity prevention.
5. Limitations in the available evidence summarised and included in this consensus may restrict the ability to draw absolute conclusions.

FUTURE UPDATES

The panel agrees that the consensus should be updated every 5 years from the publication of this statement.

PROMOTING PHYSICAL ACTIVITY: CHALLENGES AND BARRIERS

The *Healthy China 2030 Action Plan* specifically emphasises that schoolchildren and adolescents participate in no less than 60 min of daily in-school physical activity. To ensure that more than 25% of the nation's school population achieves an 'excellent' rating in fitness, this physical activity should include moderate-intensity activities that occur at least three times per week.³⁵ However, promoting an active and healthy lifestyle among Chinese school-aged children and adolescents remains a significant challenge in practice.^{12 13} In this regard, the panel recognises the following challenges and practical barriers in promoting physical activity for school-aged children and adolescents:

- ▶ Despite a wealth of evidence about the health benefits of physical activity for children and adolescents, practice and promotion of physical activity for Chinese children and youth has not been given a high public health priority at the school, community and policy level.
- ▶ There is a significant lack of school and community-based physical activity interventions or programmes that can guide and aid the development of national physical activity guidelines for Chinese children and adolescents.
- ▶ Promoting physical activity requires policies. Currently, there is a lack of school-based physical activity policies and initiatives established on a local, provincial or national scale that can effectively promote, impact and sustain school-level physical activities for children and adolescents inside and outside school settings.
- ▶ Given the major emphasis in China on academic excellence over physical education and recreational physical activity, there is a significant cultural challenge in changing attitudes and expectations of parents and schools with regard to meeting recommended physical activity or physical fitness levels.
- ▶ There is a lack of partnerships in which a wide variety of organisations (eg, schools, parents, public education, private organisations, community groups) can collaborate to promote physical activity for children and adolescents.
- ▶ There is a lack of information on potential barriers to promoting and implementing physical activity policies in school and/or community settings.

RESEARCH NEEDS AND GAPS

Given the significant limitations on the number of research studies on physical activity among Chinese children and adolescents, the panel recommends future research in the following areas:

- ▶ Continued ongoing periodic surveillance on physical activity, cardiorespiratory and musculoskeletal fitness levels and other behavioural risk factors (ie, sedentary time, BMI) among Chinese children and adolescents at the regional and national levels. Such surveillance would offer insights into the prevalence of compliance with physical activity recommendations, including meeting the WHO physical activity guidelines⁴⁰ and the Canadian 24-Hour Movement Guidelines, of which the latter calls for a minimum number hours of sleep per night, a reduction in sedentary behaviours and an increase in light-intensity and moderate to vigorous-intensity physical activities.⁴⁶
- ▶ Large-scale population cohort studies that track and examine longitudinal changes in sedentary behaviours, physical activity levels, cardiorespiratory and musculoskeletal fitness, BMI and other cardiometabolic risk factors associated with physical activity levels over time, including those for diabetes, hypertension and bone health.¹³¹⁻¹³⁸
- ▶ Cross-sectional and longitudinal prospective cohort studies that focus on examining culturally specific determinants of and health risks associated with sedentary behaviours and low levels of physical activity among school-aged children and adolescents.
- ▶ Prospective cohort studies that focus on understanding associations between children and adolescents' lifestyle behaviours (physical activities, sedentary behaviours and sleep) and various levels and improvements in body composition, cardiorespiratory and musculoskeletal fitness, cardiovascular and metabolic health, academic achievement and cognition, and mental health and quality of life.
- ▶ Cross-sectional and prospective cohort studies that aim to identify culturally relevant forms of physical activity (eg, traditional Chinese martial arts, table tennis, badminton) and expand physical activity opportunities in various settings, including out-of-school, neighbourhood and community public facility settings. Findings from these studies can be used to encourage and maximise yearlong physical activity and sports participation among children and adolescents.
- ▶ Randomised trials aimed at evaluating and establishing the effectiveness of school-based physical activity interventions, including activities or bouts of activities implemented during school break time and after-school hours, as well as before and after major school examinations.
- ▶ Research that informs policies and interventions regarding differences in patterns and types of physical activities and sports as they relate to children and adolescent boys and girls and those living in rural versus urban/suburban areas.
- ▶ Development and efficacy evaluation of culturally and contextually relevant forms of physical activity (and dietary) interventions aimed at preventing and reducing overweight

and obesity among children and adolescents. This effort should include both school-based and community-based interventions that consider the type/form (aerobic, muscle strengthening) and dose (frequency, duration, intensity) of activity as well as the dietary context.

- ▶ Research related to the deepening of the impact of Chinese school-based physical activity policies and initiatives on participation in recommended levels of physical activity both inside and outside of school settings. Relatedly, research is needed to understand the impact of school academic policies and parental pressure on children's academic excellence on the level of children and adolescents' physical activity both inside and outside of school settings.
- ▶ Intervention research that focuses on the effects of physical activity interventions in ameliorating psychosocial stress and improving mental health among children and adolescents.
- ▶ Given the traditional cultural values and expectations related to academic achievement in China, there is a need to develop home-based physical activity programmes that allow children to reallocate their sedentary time spent on completing homework to light to vigorous-intensity physical activities in home settings.
- ▶ Development of physical activity interventions aimed at increasing physical activity, particularly in settings outside the school environment. This may include, for example, studies that examine the effectiveness of home or family-based interventions (involving parents and grandparents), as well as community-based interventions and strategies implemented in school or neighbourhood settings.
- ▶ Research on capacity assessments and capacity building for schools, neighbourhoods and organisations that can adopt, implement and promote the *Healthy China 2030* physical activity initiative for school-aged children and adolescents.
- ▶ Conduct natural studies to evaluate the impact of major regional or global public health crises, such as the COVID-19 pandemic, on physical activity opportunities and behaviours. Reduced regular physical activity and increased sedentary behaviours can occur through the closure of public facilities, disrupted transportation systems and the imposition of stay-at-home and physical distancing restrictions.¹³⁹ Therefore, there is a clear public health imperative to be proactive in developing and evaluating strategies to effectively promote safe physical activity engagement for children and adolescents during and in the aftermath of such crises.^{140 141}

EVIDENCE-BASED MESSAGES FOR TEACHERS, EDUCATION EXPERTS, PARENTS AND POLICYMAKERS ON PHYSICAL ACTIVITY AMONG SCHOOL-AGED CHILDREN AND ADOLESCENTS

- ▶ Structured physical activity and/or leisure-time sports and recreational physical activities that are of moderate to vigorous intensity and reduced time spent in sedentary behaviours provide multiple health benefits for child and adolescent populations. Such benefits include, but are not limited to, cardiorespiratory, muscular and cardiometabolic fitness; cognitive functioning; and physical and mental health.
- ▶ It is important to accumulate 60 min or more of daily moderate to vigorous-intensity physical activity that involves components of aerobic, strengthening and bone-building (weight-bearing) exercises, sports and/or recreational activities.

- ▶ Recreational and non-school screen time in which children and adolescents are physically inactive should be limited to no more than 2 hours per day.
- ▶ Physical activity should be encouraged during the schooldays as it helps control childhood weight and reduces the risk of developing negative health conditions (eg, heart disease, type 2 diabetes, overweight and obesity).
- ▶ Providing social support and creating conducive playable environments encourages physical activity of various kinds.

JOINING THE GLOBAL EFFORT TO REDUCE PHYSICAL INACTIVITY

Physical inactivity and low levels of physical activity are a global public health problem associated with an array of negative health outcomes for school-aged children and adolescents. China has not been immune to this global concern as evidenced by inadequate levels of physical activity and energy imbalance among its approximately 170 million children and adolescents. This problem, coupled with obesogenic environments, lack of safe and accessible exercise facilities and socially imposed pressures to excel scholastically, presents a significant, culturally specific challenge to the realisation of the action plans established in the *Healthy China 2030* blueprint³⁵ and other global efforts.^{36–38}

The WHO and numerous countries globally have issued action plans to reduce physical inactivity and promote increased levels of physical activity. The newly developed WHO Global Action Plan on Physical Activity 2018–2030 identifies four strategic objectives to reduce time spent in inactive behaviours by 2030.³⁶ National physical activity action plans are a 'call to action' for proactive initiatives to increase physical activity using strategies and locations that reflect the social, cultural, economic and political contexts of a country.^{142–146} Therefore, developing and prioritising physical activity promotion policies, strategies and campaigns to increase awareness of existing international and national guidelines and to scale up levels of physical activity among the youth population in China is urgently needed. These concerted efforts require a public health approach¹³ and strategies that are based on the best available scientific evidence.³⁷

In this regard, this consensus, which is the first of its kind in China, aligns with the *Healthy China 2030* blueprint,³⁵ WHO Global Action Plan on Physical Activity 2018–2030³⁶ and the soon-to-be-released WHO Guidelines on Physical Activity and Sedentary Behaviour.³⁸ Taken together, these resources, which are all aimed at reducing sedentary behaviour and increasing physical activity among school-aged children and adolescents, will become a driver for developing the school, clinical and community-based interventions that are urgently needed to reverse the trends in physical inactivity and the rapidly growing obesity crisis among Chinese youths. Additionally, the lessons learnt from the implementation of recommendations in the consensus statement will provide data for comparison to other low to moderate-income and high-income countries and, additionally, expand national and global evidence on effective strategies and interventions that promote physical activity and reduce the obesity pandemic.

CONCLUSIONS

There is strong scientific evidence that children and adolescents benefit substantially in multiple health and fitness domains from engaging in 60 min or more of moderate to vigorous daily physical activity, and these benefits continue throughout their lives. Promoting physical activity among Chinese children and adolescents is both urgent and important because this population

continues to engage in activities that contribute to physical inactivity and place them at increased risk for overweight and obesity and related conditions that are detrimental to health. These conditions are most attributable to the imbalance between sufficient physical activity and overprioritising academic achievement, which results in an overload of schoolwork, as well as a high prevalence of sedentary behaviours, predominantly characterised by time spent in screen-based activities. In order to encourage a physically active lifestyle among children and adolescents, a comprehensive, evidence-based strategic plan is urgently warranted. This consensus serves as a scientific foundation for developing such a plan, and the successful promotion of physical activity among Chinese children and youth would also serve as a positive example for public health and health promotion throughout the world.

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