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Results from the China 2018 Report Card on physical activity for children and youth

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Background

Regular physical activity (PA) of moderate intensity has significant benefits for young people's health and development.^{11,15} Thus, at least one hour of moderate to vigorous intensity physical activity (MVPA) daily is recommended for children and adolescents by the World Health Organization.¹⁶ With the development of technology and the change of lifestyle, however, it has been reported 80% of adolescents around the world do not reach recommended levels for daily physical activity.⁴ China, as the most populous country in the world, suffers the burden of declining PA levels and increasing sedentary behaviour (SB) among children and adolescents as well. Recently regional and national surveillance data show that only a few Chinese young people meet the guideline of at least 60 min of MVPA daily and over three quarters of them have more than 2 h SB time.^{2,6} The lack of PA of Chinese young people may increase the

risk of a series of health hazards, such as the increasing prevalence of overweight and obesity.³

In order to promote physical activity of children and adolescents, the first and foremost step is to monitor the prevalence of youth PA and the related environmental factors. So that evidence based actions or interventions can be designed and implemented effectively. Although studies on youth PA has emerged in China, most of them are in regional level and non-population based in design and involve the use of diverse outcome measures. Nationwide representative surveillance and international comparable data on youth PA in China is still lacking.⁵ In 2014, a research group from the Shanghai University of Sport (SUS) joined the Active Healthy Kids Global Alliance (AHKGA) and initiated the inaugural Report Card programme in China. Later in 2016, SUS released the 2016 Shanghai (China) Report Card on Physical Activity for Children and Youth in Bangkok, Thailand,⁶ as one part of Global Matrix 2.0.¹²

However, it should be pointed out that the 2016 Report Card only represents Shanghai and cannot be considered as the China Report Card due to the large economic and geographic differences between Shanghai and the rest of China. To complete the genuine inaugural China Report Card, the SUS research team conducted the national surveillance afterwards.¹ The purpose of this paper is, therefore, to present the procedures and the results of the inaugural China Report Card on Physical Activity for Children and Youth. In addition, the grade for each indicator is briefly described. The data herein were derived from a national surveillance carried out from October to November, 2016, in which over 125,000 children aged 9–17 years, as well as their parents, school administrators and teachers were investigated.

Methods

The research team of China Report Card is consisted 9 researchers from the SUS, co-led by Prof. Yan Tang and Dr. Yang Liu, under the supervision of Prof. Pei-Jie Chen. In addition, international and national experts have been involved in formulating China Report Card. In recently years, since the Ministry of Education (MOE) in China organized the national surveillance of students'

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physical fitness, which is conducted by SUS and other universities/institutions. In order to be able to present the China Report Card with national representative data, research team and SUS negotiated with MOE of China and conducted the Physical Activity and Fitness in China—The Youth Study (PAFACTYS) during the physical fitness test.¹ The survey protocol for China 2018 Report Card was on the basis of Global Matrix 3.0 and Shanghai's (China) 2016 Report Card.⁶ Integrating indicators for Report Card with the current existed national survey be a rational example for other countries.

The PAFACTYS was conducted from October to December in 2016, coordinated by the Ministry of Education of China and conducted by SUS, in which a three-stage stratified cluster sampling design was used to sample a nationally representative group of school-children among schools from 22 provinces, 4 municipalities, 5 autonomous regions, and Xinjiang Production and Construction Corps (an independent division within Xinjiang Uygur Autonomous Region), in Mainland China.^{1,13} Detailed information regarding the sampling can be found elsewhere.² The study was approved by the Ethics Committee of Shanghai University of Sport and parental/guardian consent and participant assent for participating in the survey were acquired respectively.

The data from the PAFACTYS for 2018 China Report Card included a representative sample of Chinese school-aged children ($n = 125,281$, boys: 49.6%, aged 9–17 years). Self-report questionnaires were completed by the sampled students, their parents/guardians ($n = 125,281$), and physical education teacher ($n = 1398$) from each sampled school. In addition, physical fitness was assessed for all sampled students who have participated in the survey through the Physical Fitness and Health Surveillance of Chinese School Students.^{10,17} Thus, the 10 core physical activity indicators that are common to the Global Matrix 3.0 Overall Physical Activity, Organized Sport Participation, Active Play, Active Transportation, Sedentary Behaviour, Physical Fitness, Family and Peers, School, Community and Environment, and Government Strategies and Investments are covered (Table 1).⁷ The grade for each indicator is based on the percentage of children and youth meeting a defined benchmark derived from the PAFACTYS: A is 80%–100%; B is 60%–79%; C is 40%–59%; D is 20%–39%; F is 0%–20%. For each indicator, the upper 7% of grade range is marked with '+' and the lower 7% of each grade range is marked with '-'. To produce nationally representative estimates, sample weights were applied to account for the clustering effect of sampling by school.

Results

The grades of 10 indicators are summarized in Table 2 and the

cover page of China Report Card is presented in Fig. 1.

Discussion

The 2018 China Report Card is the inaugural annual assessment of physical activity, sedentary behaviour and their social context with national representative samples in China. The cover page (Fig. 1), several young boys playing football on the school playground, is a cartoon symbol of recently national strategy of "The Promotion of Football on Campus". It is not merely to improve the level of Chinese football, but also to promote physical activity and physical fitness of Chinese children and adolescents through various means in and outside school.

Overall physical activity levels: F

Of all students who have participated in the PAFACTYS, only 13.1% reported that they were physically active at least 60 min daily in past 7 days. Thus, the grade of F was assigned to Overall Physical Activity Levels. Boys (14.5%) were more active than girls (11.7%) ($p < 0.01$). The rates of meeting the PA guideline decreased gradually with age from primary school (18.9%), to secondary school (11.9%), and finally to upper secondary school (8.0%) ($p < 0.01$). The rates are even lower than findings the previous Shanghai Report Card⁴ and the average grade from Global Matrix 2.0.¹² In addition, results from the present indicated that more urban youth (13.8%) meet the PA guideline than rural youth (12.6%) ($p < 0.01$) in China.

Table 2

Grades according to physical activity indicator in the 2018 China Report Card on physical activity for children and youth.

Indicator	Grades
Overall Physical Activity Levels	F
Organized Sport Participation	D-
Active Play	D+
Active Transportation	C+
Sedentary Behaviours	F
Physical Fitness	D
Family and Peers	D+
School	D+
Community and the Built Environment	F
Government strategies and investments	F

Note, the grade for each indicator is based on the percentage of children and youth meeting a defined benchmark: A+ is 94%–100%; A is 87%–93%; A- is 80%–86%; B+ is 74%–79%; B is 67%–73%; B- is 60%–66%; C+ is 54%–59%; C is 47%–53%; C- is 40%–46%; D+ is 34%–39%; D is 27%–33%; D- is 20%–26%; F is <20%; INC is Incomplete data.

Table 1

Indicators and assessing instruments of the 2018 China Report Card on physical activity for children and youth.

Indicator	Instruments
Overall Physical Activity Levels	Daily moderate-to-vigorous physical activity (MVPA) at least 60 min in past 7 days
Organized Sport Participation	Participation of organized sport and/or physical activity (PA) programs over the past 12 months
Active Play	Participation in unstructured/unorganized PA at least four times during past week
Active Transportation	Going school and go back home from school by walk or bicycle
Sedentary Behaviour	Watching TV/film, playing computer/video games, surfing the internet and doing homework at least 2 h per day on weekdays and weekend days
Physical Fitness	Reached the level of 'excellent' or 'good' based on The Physical Fitness and Health Surveillance of Chinese School Students
Family and Peers	Response 'very often' at least two items for parents' support, and response 'very right' at least two items for friends support for PA
School	Meet the benchmark regarding 1) students' satisfaction with physical education (PE) and exercise-related opportunities in school; 2) the amount of accredited PE teachers with state teacher qualification; 3) PA after school; 4) PE classes; 5) facilities and equipment for sport and exercise in school; and 6) the school administrator's concern about PA, exercise and PE of students.
Community and the Built Environment	Meet the benchmark regarding 1) whether it is easy to find facilities and equipment for sport/exercise in young people's community; 2) whether there is organizations of sport/exercise (e.g. sport club) for youth in community; 3) whether there are sport/exercise activities organized in community
Government Strategies and Investments	Parents' awareness around the national physical activity policies of China children



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Fig. 1. Front cover of the 2018 China physical activity Report Card.

These findings derived from national surveillance highlight the challenge of lacking of PA among Chinese school-aged children.

Organized sport participation: D-

Organized Sport Participation is one of important ways for children and youth to engage in PA. Students were asked whether they had taken part in organized sport and/or PA programs over the past 12 months. The grade of D- was assigned to Organized Sport Participation as 20.5% of young people answered they had. The percentage of boys (19.5%) participated in Organized Sport Participation is lower than girls (21.6%), which is reversed compared with Shanghai Report Card (Liu 2016) ($p < 0.01$). Similar to the trend of OPA Level, the rates of Organized Sport Participation dropped from the primary school (23.6%), to secondary school (22.1%), and to upper secondary school (15.7%) ($p < 0.01$). However, unlike the Overall Physical Activity Level, result indicated that more rural students (22.2%) participated in Organized Sport Participation than urban students (18.9%) ($p < 0.01$). Anyway, it should be noted that, only 0.5% above the grade of F still reflects a very poor situation of Organized Sport Participation in China.

Active play: D+

Active Play is another important way for students to be physical active in addition to Organized Sport Participation. In the present study, the grade of Active Play is determined as the percentage of children and youth who participate in unstructured/unorganized PA at least four times during past week (at least 60 min per occasion). 38.7% of students confirmed and therefore D+ is assigned to Active Play. There are gender (Boy 43.2%; Girl 34.3%), age (Primary school 49.4%; Secondary school 36.6%; Upper secondary school

29.3%) and residence (Urban 39.7%; Rural 38.0%) differences in AP as well ($p < 0.01$). The low level of Active Play implies the fact that heavy homework of academic pressure on student is common in China.

Active transportation: C+

Concerning Active Transportation Students were asked about their transportation ways of going to school and going back home from school every day. Active Transportation was considered the percentage of those who reported that they go to school by walk or by bicycle. C+ was assigned in according to 56.3% of Chinese students walk or cycle to school. It should be pointed out that Active Transportation ranks the highest grade among all 10 indicators in China Report Card. However, we should be aware that with the Chinese economy booming and the expansion of cities, more and more Chinese students might go to school by car or by public transportation in future. For instance, the grade of Active Transportation in Shanghai is C-, much lower than in average grade in China.⁶

Sedentary behaviours: F

Regarding to Sedentary Behaviour, students were asked to answer how many hours they spent watching TV/film, playing computer/video games, surfing the internet and doing homework per day both on weekdays and weekend days. The grade F was given for Sedentary Behaviour since 92.9% of students spend 2 h or more every day in these activities. Boys (93.5%) are more sedentary than girls (92.4%) ($p < 0.01$). And the proportion of Sedentary Behaviour increased with age (Primary school 86.8%; Secondary school 96.1%; Upper secondary school 96.1%) ($p < 0.01$). The grade of F emphasizes the increasing screen-based time, especially the use of mobile phone and heavy load of homework in China in recent years. In Shanghai 2016 Report Card, the percentages of sedentary young people were 75.2% and 88.6% on weekdays and weekend days respectively.⁶

Physical fitness: D

In China, nationwide physical fitness testing has been conducted since 1954. In 2014, the new China National Standard of Students' Physical Fitness was released, which prescribed annual compulsory physical fitness testing for every student from the primary school grades through university or college,⁵ including Body Mass Index, Vital Capacity, 50-m Sprint, Sit and Reach, Standing Long Jump, 1-mixture Sit-ups (Girl)/Pull-ups (Boy), and 800-m Run (Girl)/1000-m Run (Boy). Four categories ('Excellent', 'Good', 'Pass', and 'Fail') are given to each student based on the composited score from 0 to 100 according to the results of all tests. In present study, the grade of D for Physical Fitness was assigned as the percentage of 'Excellent' and 'Good' is 30.0% based on the Physical Fitness and Health Surveillance of Chinese School Students 2016. Significant gender, age and residence differences were observed among children in Physical Fitness categories, with more boys not achieving fitness standards compared to girls, and children living in urban areas being less likely to achieve fitness standards than those living in rural areas in China.¹⁷

Family and peers: D+

Support from Family and Peers is a key influential factor of PA of children and youth. Students were asked to answer 9 items regarding parental support and 4 items regarding friends support on their PA respectively. Family and Peers was determined by the

percentage of those who response 'very often' at least two items for parental support and response 'very right' at least two items for friends support for PA, and the grade of Family and Peers is D+ (37.5%). The results showed that FP decrease with age rapidly (Primary school 48.2%; Secondary school 37.2%; Upper secondary school 26.8%) ($p < 0.01$). Based on the same data, comprehensive analyses demonstrated that among Chinese school children, parental support for PA is important in promoting and facilitating children's participation in MVPA.⁹

School: D

School is the place in which students spend most of their time and school infrastructure, policies and programs are very important for students' PA.¹⁸ This study contains 6 items regarding school environment by asking students and school administrators/teachers: 1) students' satisfaction with physical education (PE) and exercise-related opportunities in school; 2) the amount of accredited PE teachers with state teacher qualification; 3) PA after school; 4) PE classes; 5) facilities and equipment for sport and exercise in school; and 6) the school administrator's concern about PA, exercise and PE of students. The grade of D was assigned in accordance with the average percentage (37.5%) across the above-mentioned school indicators. Notably, this grade of China is much lower than the grade of Shanghai (B+, 80.1%) with identical measures. Meanwhile, students from urban area (42.4%) have a better school environment than students from rural area (35.4%) ($p < 0.01$).⁶ The results of these two comparisons uncover the fact that there are huge differences of school factors influencing students' PA in different areas in China. Hence, it is a long way to improve the PA related school factors across China.

Community and the built environment: F

Community and the Built Environment is another important factor that may influence young people's PA. Community and the Built Environment was defined in this study as meeting the benchmark: 1) whether it is easy to find facilities and equipment for sport/exercise in young people's community; 2) whether there are organizations of sport/exercise (e.g. sport club) for youth in community; and 3) whether there is sport/exercise activities organized in community. The grade of F was assigned in light of the average percentage (14.8%) of aforementioned indicators. Boarder analyses from the PAFCTYS showed that children's perceptions of the frequency of community-sponsored sports events, availability of sports clubs and organizations, and convenient access to PA facilities were associated with a high level of MVPA participation.¹⁴ Therefore, this grade of F indicates that sports organizations and activities should be promoted, as well as improvements in the quantity and quality of community facilities and equipment.

Government strategies and investments: F

In response to the challenges regarding the decreasing of Chinese young people's PA and health, the Chinese government in the past decade has issued a series of policies and planned interventions (2007: No. 7; 2012: No. 53; and 2016: No. 27).⁵ However, it does not necessarily, or cannot reflect the fact of the effects of these government strategies and investments. As defined by the AHKGA, one of the benchmarks for this indicator is "demonstrated progress through the key stages of public policy making (i.e., policy agenda, policy formation, policy implementation, policy evaluation, and decisions about the future)." Thus, the Government indicator was assessed by gauging the public awareness around the national PA policies, and despite these policies being updated nearly every

decade, only 17.8% of parents reported being aware of such policies, hence the low F grade was assigned. Parents from rural area (16.1%) were less aware of those policies than parents from urban area (19.5%) ($p < 0.01$).

Overall, compared with Shanghai's 2016 Report Card,⁶ we found that for indicators regarding PA behaviors, such as Organized Sport Participation (China: D-; Shanghai: F), Active Play (China: D+; Shanghai: D-), and Active Transportation (China: C+; Shanghai: C-) are better on the national level than in Shanghai. Meanwhile, indicators regarding the social context, such as School (China: D+; Shanghai: B+), Family and Peers (China: D+; Shanghai: B), Community and Environment (China: F; Shanghai: D+), and Government (China: F; Shanghai: D) are poorer on the national level than in Shanghai. Nevertheless, a grade of F was assigned for Overall PA and Sedentary Behaviour on both the national level and in Shanghai due to the small proportion of young people in China meeting the PA or sedentary behaviour recommendations.

Strengths and limitations

The prominent strength of this inaugural 2018 China Report Card is that the results are based on nationally representative surveillance data with large size samples from all over mainland China. Therefore, the high quality evidence-based grades of all 10 indicators are able to demonstrate the general situation of PA and sedentary behaviors and the social context of those behaviors as well as the physical fitness of Chinese children and adolescents. In addition, PA and its related factors were assessed comprehensively though students, parents, school administrators, and teachers respectively by questionnaire developed, with improvement after 2016 Shanghai Report Card, by the working group. Apart from these strengths, it should be pointed out that self-report measures may overestimate PA and underestimate sedentary behaviour, though the items used in present study demonstrate reasonable reliability in China.⁸ Furthermore, the subjective cut-off of some indicators for grade assigning may not avoid the possibility of causing the artificial significant results.

Conclusion

To conclude, the present study illustrated that levels of PA and SB of Chinese youth were low and below the recommended guidelines. Interventions and policies at the community and environment level should be encouraged to promote PA and reduce sedentary behaviour, with special focus on girls, students from upper secondary schools and students from rural schools. In addition, national policies on young people's PA should be advocated widely to ensure the policies can be transferred into actions.

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References

1. Chen PJ. Physical activity, physical fitness, and body mass index in the Chinese child and adolescent populations: an update from the 2016 physical activity

- and fitness in China—The youth study. *J Sport Health Sci.* 2017;6(4):381–384.
2. Fan X, Cao ZB. Physical activity among Chinese school-aged children: national prevalence estimates from the 2016 physical activity and fitness in China—the youth study. *J Sport Health Sci.* 2017;6(4):388–394.
 3. GBD 2015 Obesity Collaborators. Health effects of overweight and obesity in 195 countries over 25 years. *N Engl J Med.* 2017;377(1):13–27.
 4. Hallal PC, Andersen LB, Bull FC, et al. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet.* 2012;380(9838):247–257.
 5. Liu Y. Promoting physical activity among Chinese youth: No time to wait. *J Sport Health Sci.* 2017;6(2):248–249.
 6. Liu Y, Tang Y, Cao ZB, et al. Results from the 2016 Shanghai (China) Report Card on physical activity for children and youth. *J Phys Activ Health.* 2016;13(Suppl 2):S124–S128.
 7. Liu Y, Tang Y, Cao ZB, et al. Results from the China 2018 Report Card on physical activity for children and youth (Abstract). *J Phys Activ Health.* 2018. <https://doi.org/10.1123/jpah.2016-0314>. in press.
 8. Liu Y, Wang M, Tynjälä J, et al. Test-retest reliability of selected items of health behaviour in school-aged children (HBSC) survey questionnaire in Beijing, China. *BMC Med Res Methodol.* 2010;10:73.
 9. Liu Y, Zhang Y, Chen S, et al. Associations between parental support for physical activity and moderate-to-vigorous physical activity among Chinese school children: a cross-sectional study. *J Sport Health Sci.* 2017;6(4):410–415.
 10. Ministry of Education of China. *The National Standard of Physical Fitness and Health of Student*; 2014. <http://old.moe.gov.cn/publicfiles/business/htmlfiles/moe/s3273/201407/171692.html>. Accessed August 10, 2018.
 11. 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 Metabol.* 2016;41(Suppl. 3):S197–S239, 6.
 12. Tremblay M, Aguilar-Farias N, Akinroye K, et al. Global Matrix 2.0: Report Card grades on the physical activity of children and youth comparing 38 countries. *J Phys Activ Health.* 2016;13(Suppl 2):S343–S346.
 13. Wang DF. Improving school physical education to increase physical activity and promote healthy growth of Chinese school-aged children—time for action. *J Sport Health Sci.* 2017;6(4):384–386.
 14. Wang L, Tang Y, Luo J. School and community physical activity characteristics and moderate-to-vigorous physical activity among Chinese school-aged children: a multilevel path model analysis. *J Sport Health Sci.* 2017;6(4):416–422.
 15. World Health Organization. *Fact Sheet on Physical Activity*; 2018. <http://www.who.int/mediacentre/factsheets/fs385/en/>. Accessed August 10, 2018.
 16. World Health Organization. *Global Recommendations on Physical Activity for Health.* 2010. Geneva.
 17. Zhu Z, Yang Y, Kong Z, et al. Prevalence of physical fitness in Chinese school-aged children: findings from the 2016 physical activity and fitness in China—The youth study. *J Sport Health Sci.* 2017;6(4):395–403.
 18. Wang L, Tang Y, Luo J. School and community physical activity characteristics and moderate-to-vigorous physical activity among Chinese school-aged children: a multilevel path model analysis. *J Sport Health Sci.* 2017;6(4):416–422.