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## Results from the Singapore 2022 report card on physical activity for children and adolescents

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## ABSTRACT

**Background:** While it has been established that physical activity (PA) is key to promote overall health and well-being, insufficient physical activity among children and adolescents is a global problem, including Singapore. It is important to understand the local PA landscape among children and adolescents to decrease surveillance gaps and identify areas for improvement in promoting PA. The present article provides an overview of the development of the 2022 Active Healthy Kids Singapore Report Card and the results, as well as underscore limitations and gaps in the available evidence related to PA among children and adolescents in Singapore.

**Methods:** Following the Global Matrix 4.0, the available data between July 2010 to July 2020 was synthesized for all 10 indicators by the work group and reviewed by a panel of experts. Data sources included published scientific articles, government and non-government reports, national surveys, and unpublished data from on-going research studies. Where possible, grades were informed by nationally representative surveys or large-scale longitudinal studies.

**Results:** The grades assigned were: Overall Physical Activity (C-), Organized Sport and Physical Activity (B-), Active Play (C-), Active Transportation (C), Sedentary Behaviours (C-), Physical Fitness (Incomplete), Family and Peers (C-), School (Incomplete), Community and Environment (A+), Government (B).

**Conclusion:** This is the first comprehensive evaluation of PA among children and adolescents in Singapore. It provides baseline grades valuable for future comparison. It also illustrates gaps in the existing evidence which can inform future surveillance, facilitate international comparisons and enable global efforts in promoting physical activity.

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## 1. Introduction

Promotion of physical activity (PA) in children and adolescents benefits overall health, including physical fitness, cardiometabolic health, bone health, cognitive outcomes and mental health.<sup>1,2</sup> When considering 24-h movement behaviour profiles of children from the same study, it was found that behaviours of Singaporean children track with age, and that children shift towards less active and more sedentary lifestyles with increasing age.<sup>3</sup> Aside, research in Singapore has also demonstrated that longer screen viewing

time in younger children is associated with longer sedentary time and shorter time engaged in physical activity in later childhood.<sup>4</sup> This highlights the importance of improving methods of PA promotion in children and adolescents in Singapore.

In the recent years, both PA promotion and movement behaviours have received increasing attention among policymakers in Singapore. Specific to children and adolescents, two new national guidelines were developed; the Singapore Integrated 24-Hour Activity Guidelines (2021) which provided recommendations for children and adolescents aged 7–18 years using a holistic approach to integrate all types of activity within a 24-h period<sup>5</sup> and; the Singapore Physical Activity Guidelines (SPAG 2022) which included recommendations for different population segments, including 0–6 years old.<sup>6</sup>

Aside from having up-to-date guidelines, it is also important to understand the local policy landscape to decrease surveillance gaps and identify areas for improvement in promoting PA in children and adolescents. While nationwide surveys, such as the Student Health Survey and National Sports Participation Survey, are conducted regularly to obtain PA-related information, each survey targets different age groups. As such, it is difficult to develop a comprehensive understanding of the PA levels among children and adolescents in Singapore.

With the increasing attention on PA and movement behaviours, the lack of comprehensive assessment of current PA levels among children and adolescents, as well as recognizing the opportunity to compare the PA landscape in Singapore with other countries globally, Singapore joined the Global Matrix 4.0 Project. The 2022 Active Healthy Kids Singapore Report Card (see Fig. 1) is part of the

project led by the Active Healthy Kids Global Alliance (AHKGA), a non-profit organisation. The Report Card uses an evidence-based approach to consolidate and assess existing local evidence on PA behaviours among children and adolescents to promote a healthier lifestyle through policy development and research. The consolidated evidence is then graded by being benchmarked against the best available up to date published or unpublished evidence across PA. The Report Card has diverse indicators related to individual behaviours, settings and sources of influence such as family and peers, school, community and environment, and government. In the latest Global Matrix 3.0, 49 countries participated and followed the harmonized procedure to grade the indicators.<sup>7</sup> Participating countries reported that the Global matrix and Report Card activities has helped to raise awareness, build capacity, increase government involvement, initiate new policies, improve surveillance, provide positive outcomes in research, and generate attention in the media.<sup>7</sup>

The purpose of the present article is to provide an overview of the development of the 2022 Active Healthy Kids Singapore Report Card following the Global Matrix 4.0, and the results, as well as underscore limitations and gaps in the available evidence related to PA among children and adolescents in Singapore.

## 2. Methods

### 2.1. Research work group (RWG) and stakeholder group

The 2022 Active Healthy Kids Singapore Report Card was developed and produced by a RWG of 4 researchers from the Physical Activity and Nutrition Determinants in Asia research programme at the Saw Swee Hock School of Public Health, National University of Singapore. Separately, experts whose work are relevant to PA promotion in children and adolescents were approached, and a stakeholder group was formed. The stakeholder group is made up of 3 academics and 2 government officials from the Health Promotion Board, Singapore (HPB) and Sports Singapore (SportSG) respectively. The stakeholder group provided inputs on identifying key data sources, were consulted on major decisions made by the RWG, reviewed the proposed grades and supporting evidence developed. These grades and supporting evidence were then finalized, reviewed, and validated by two external experts from the AHKGA.

### 2.2. Selection of data sources

The Report Card includes 10 core indicators common to the Global Matrix 4.0: Overall Physical Activity, Organized Sport Participation, Active Play, Active Transportation, Sedentary Behaviours, Physical Fitness, Family and Peers, School, Community and Environment, and Government. The available data was synthesized by RWG and reviewed by the stakeholder group. A data source was included if it met all the following criteria: (1) covered children and adolescents aged 0–18 years in Singapore; (2) contained information of at least one of the 10 indicators; and (3) relevant data collected and released between July 2010 to July 2020. Typically, data for children aged below 6 years old are not included in the report card. Notwithstanding, there might be mention of whole data source(s) that holds data for older children (i.e., 6–18 years) in the studies for younger children (i.e., 0–5 years). Hence, a wider age range (i.e., 0–18 years) was applied during the search for data source.

A total of 36 published studies or reports pertinent to 10 core indicators were identified. While data sources identified include published scientific articles, government and non-government reports, unpublished data from on-going research studies and



Fig. 1. Front cover of the active healthy kids Singapore report card.

personal contacts, most of the studies were small scale and not representative. Hence, only data synthesized from national surveys or large-scale longitudinal studies were used as major sources to inform grades for most of the 2022 Report Card indicators (see Table 1). These major data sources include Student Health Survey, National Sports Participation Survey and Growing Up in Singapore Towards healthy Outcomes Cohort study. Agencies in charge of these datasets were then contacted to obtain the latest dataset available.

2.2.1. Student Health Survey (SHS)

Since 2006, the national SHS was conducted once every 3 years to track health behaviours among students aged 13–17 years old (i.e., secondary school students). The latest SHS dataset was obtained in 2015. However, the dataset was not publicly available and the RWG was not able to obtain the data due to bureaucratic challenges. Only the aggregated data on percentage of school-going adolescents who accumulated at least 60 min of moderate-to-vigorous intensity physical activity (MVPA) per day on average from 2015 SHS was available (Guthold et al. 2020<sup>8</sup>) and the data was used to grade ‘Overall Physical Activity’ (see Table 1).

2.2.2. National Sports Participation Survey (NSPS)<sup>9</sup>

This is a national survey conducted once every 5 years managed by SportSG, with a focus on sports participation and sports culture in Singapore. Face to face interviews were conducted among Singapore and permanent residents aged 13 years old and above from randomly sampled households provided by the Department of Statistics, Singapore. The 2020 NSPS dataset, collected between January 2020 to December 2020, was identified as the latest dataset through the communication with the SportSG representative. Using the 2020 NSPS, aggregated data on regular participation in sport or PA at least once a week from 13 to 19 years old was obtained and used to grade ‘Organized Sport and Physical Activity’.

2.2.3. Growing Up in Singapore Towards healthy Outcomes (GUSTO) Cohort study<sup>10,11</sup>

The GUSTO study studies how conditions in pregnancy and early childhood influence the health and development of women and children. It is an ongoing large-scale and longitudinal birth cohort in Singapore, with 1247 pregnant women recruited in 2009–2010 and a total of 1171 singleton births were followed up. As the cohort progresses, survey questionnaires were administered by proxy to the parents/caregivers of children at different time points (see Table 1). With the large sample size and wider representation of age groups, survey data collected by proxy from 8 years old and 5.5 years old were used to grade the respective indicators (see Table 1).

2.3. Grade assignment

In the process of evaluating the evidence and grade assignment,

**Table 1**  
Data sources used in grading for the 2022 Active Healthy Kids Singapore Report Card.

Survey Name	Data Collection Period	Sample Size	Age Range	Physical Activity Measures	Indicators
<b>Student Health Survey 2015<sup>8</sup></b>	2015	9151	13–17 years old	Self-report	Overall Physical Activity
<b>National Sports Participation Survey<sup>9</sup></b>	Jan to Dec 2020	~ 400	13–19 years old	Self-report	Organized Sport and Physical Activity
<b>GUSTO Cohort study<sup>10,11</sup></b>	Nov 2017 to July 2019	830	8 years old	Proxy-report (Parent/caregiver)	All, except Physical Fitness, School and Government
<b>GUSTO Cohort study<sup>10,11</sup></b>	June 2015 to Dec 2016	856	5.5 years old	Proxy-report (Parent/caregiver)	Community and Environment

the RWG held multiple discussions and considered factors such as age range covered by the evidence made available to the research team, sample size, data recency and method of data measurement into data synthesis. When more than one data source exists for a particular indicator, simple average was obtained and used for the grade assignment. Letter grades were assigned to the 10 indicators, according to pre-defined benchmarks and grading rubric in the Global Matrix 4.0. The grade for each indicator is based on the percentage of children and adolescents 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% (see Table 2). In the event of absence of data that best fit the benchmark(s) of the indicator, ‘Incomplete (INC)’ was assigned (see Table 2). Feedback on initial grades were collected from the stakeholder group via virtual meetings or emails. Grades and the assigning rationale were then revised by the RWG, audited by the AHKGA, and finalized by the RWG.

3. Results

The 2022 Active Healthy Kids Singapore Report Card is the first comprehensive assessment of PA among children and adolescents in Singapore. The grades are summarized in Table 2. Community and Environment indicator received the highest grade (A+), followed by the Government (B) and Organised Sports Participation indicators (B-). The remaining indicators were assigned as either C or C- and 2 indicators were assigned ‘INC’.

3.1. Overall Physical Activity: C-

The benchmark used is the percentage of children and adolescents who meet the Global Recommendations on Physical Activity

**Table 2**  
Grades assigned to indicators in the 2022 active healthy kids Singapore report card on physical activity for children and adolescents.

Indicator	Grades
Overall Physical Activity	C-
Organized Sport and Physical Activity	B-
Active Play	C-
Active Transportation	C
Sedentary Behaviours	C-
Physical Fitness	INC
Family and Peers	C-
School	INC
Community and Environment	A+
Government	B

Note. The grade for each indicator is based on the percentage of children and adolescents 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.

for Health, which recommend that children and adolescents accumulate  $\geq 60$  min of MVPA per day on average. Data from the school-based and self-reported 2015 SHS revealed that 23.7% of school-going adolescents aged 13–17 years old engaged in  $\geq 60$  min daily MVPA.<sup>8</sup> From the GUSTO cohort study survey data, 65% of 8 years old children in the study met the international recommendation. The simple average is 44.4% and the grade assigned is C-.

### 3.2. Organized Sport and Physical Activity: B-

The benchmark used is the percentage of children and adolescents who participate in organized sport and/or PA programs. Based on the 2020 NSPS, 75% of children aged 13 to 19 reported to participate in organized sports at least once a week. 52% of 8-year-old children in the GUSTO cohort study were involved in organized sport activity during the week by proxy report. The simple average is 63.5% and the grade assigned is B-.

### 3.3. Active play: C-

The benchmark used is the percentage of children and adolescents who engage in unstructured or unorganized active play at any intensity for more than 2 h a day. In the GUSTO cohort study, 44.4% of 8-year-old children spend an average of more than 2 h per day in indoor and/or outdoor active play, where active play was defined as play activities done, using objects or their own body that result in bursts of high energy expenditure, that make one breathe harder than normal. The grade assigned is C-.

### 3.4. Active transportation: C

The benchmark used is the percentage of children and adolescents who use active transportation to get to and from places (e.g., school, park, mall, friend's house). In the GUSTO study, 48% of 8-year-old children spend  $\geq 50\%$  of total transport duration in active transport to get to and from places, including walking and biking. The grade assigned is C.

### 3.5. Sedentary Behaviours: C-

The benchmark used is the percentage of children and adolescents who meet the Canadian Sedentary Behaviour Guidelines of  $< 120$  min of recreational screen time. Based on parent-report in the GUSTO cohort study, 41% of 8-year-old children meet the guidelines. The grade assigned is C-.

### 3.6. Physical fitness: INC

There was no nationally representative or data from large-scale observational studies available to match the benchmark under the indicator. The grade assigned is INC.

### 3.7. Family and peers: C-

The benchmark used is the percentage of family members who facilitate PA and sport opportunities for their children. In the GUSTO cohort study, 55% of parents or caregivers encouraged their 8-year-old child to play outside when the weather is suitable, and 29% of parents or caregivers were physically active with or in front of their child. The simple average is 42% and the grade assigned is C-.

### 3.8. School: INC

Quantitative evidence specific to the benchmarks of the

indicator were unattainable, hence, no grade was assigned. Qualitative evidence includes news reports detailing that the “Ministry of Education (MOE) said that by 2017, all schools would have implemented the 1-h increase in PE curriculum time to 2 h per week”.<sup>12</sup> An official Physical Education Syllabus for primary, secondary and pre-university levels also exists.<sup>13</sup> In 2016, the NurtureSG taskforce, a multi-government agency taskforce, was formed to strengthen health promotion in schools and institutes of higher learning and to increase opportunities for PA. In June 2017, recommendations made by the taskforce were consolidated into an action plan report. In July 2017, an MOE press release mentioned that these recommendations were progressively rolled out across pre-schools, schools, and Institutes of Higher Learning, albeit with no quantitative substantiation.<sup>14,15</sup>

### 3.9. Community and environment: A+

The benchmarks used include i) percentage of children or parents who report having facilities, programs, parks, and playgrounds available to them in their community and ii) percentage of children or parents who report living in a safe neighbourhood where they can be physically active. In the GUSTO cohort study, 99.8% of 5.5-year-old parents and 97% of 8-year-old parents reported the presence of neighbourhood open areas, park, playground, swimming pool, gym, or sports activities club. 88.5% of 5.5-year-old parents perceived the neighbourhood environment to be safe for children's PA. The simple average across these three data points is 95.1% and the grade assigned is A+.

### 3.10. Government: B

It is challenging to assign a grade for this indicator due to a lack of a definitive benchmark and lack of more definitive evidence such as the actual funding figures in national PA programmes and interventions by the statutory boards, SportSG and HPB. These statutory boards are funded annually by the Ministry of Culture, Community and Youth and the Ministry of Health. Overall, it is evident that HPB, SportSG, and the Ministry of Education are actively providing resources to promote PA among children and adolescents in Singapore. However, their implementation and effectiveness remain largely unknown. As mentioned previously, a multi-agency government taskforce, NurtureSG, was set up in 2016 to promote health among children and adolescent.<sup>14</sup> However, it is unclear if there is existing coordination with other stakeholders (such as private sector and civil society) to promote PA in young children and adolescents. The built environment in Singapore is also supportive of physical activities. The grade assigned is B.

## 4. Discussion

This is the first national Report Card which synthesizes the available evidence and examines PA and its relevant indicators from multiple levels in Singaporean children and adolescents. Most indicators were assigned as either C or C-, with the highest grade assigned to Community and Environment (A+), followed by the Government (B) and Organised Sports Participation (B-). This Report Card also highlights gaps in the current evidence and demonstrates opportunities for the improvement of national PA surveillance and promotion in the young population, facilitate international comparisons and contribute to global efforts in promoting PA worldwide.

The built environment in Singapore is both conducive and safe for encouraging PA for its population. Public playgrounds are regarded as a basic precinct recreational facility in public housing estates. The built has evolved over the years from only functional

play equipment, such as slides and swings, to thematic playgrounds with a selection of play equipment as a key feature, supporting wider array of activities such as climbing, swinging, balancing and jumping.<sup>16</sup> Improving park access has also been emphasized as one of the targets under the 'City in Nature' pillar of the Singapore Green Plan for 2030. Under the pillar, "every household will be within a 10-min walk from a park" was listed as one of the targets.<sup>17</sup> Aside from playgrounds and parks, evidence also suggests that well-designed sports infrastructure and facilities are in place.

It is evident that the government puts in effort to promote PA among children and adolescents. These efforts include allocating funds and resources to both HPB and SportSG, as well as implementing a nationwide PA plan (e.g., NurtureSG) and releasing up-to-date national guidelines for PA.<sup>6,14</sup> However, continuous monitoring of relevant outcomes and evaluation of the effectiveness of such implementation are needed.<sup>18,19</sup> As observed from the 'Organised Sport and Physical Activity' indicator, more than half of children aged 13 and above regularly participate in organised sports programmes. However, to enable a more comprehensive evaluation, more frequent surveillance data are needed in the younger population (i.e., children aged 12 years and below). Many children also fail to meet the screen viewing guidelines despite efforts to tackle SB among children and adolescents in Singapore.<sup>2,14</sup> Overall, additional efforts should be urged to reduce SB, and to improve overall PA, active play, active transportation, as well as family and peers related factors, by the government and/or civil society. Future studies with robust and comprehensive data are also necessary to assess physical fitness levels among children and adolescents in Singapore.

The articles identified during the search process were also published in the last 5 years, highlighting the increasing recognition on the importance of understanding PA in children and adolescents in Singapore. Out of 36 published studies or reports pertinent to the 10 core indicators identified, only two data sources (SHS and NSPS) cover a nationwide representative population of adolescents, providing adequate information for Overall Physical Activity and Organised Sports Participation. However, they only include data from 13 years and above and do not reflect the children population. Data collected from national surveys is typically owned by the government with no public access. Due to bureaucratic challenges, the SHS data was not accessible for the team and could not be used for other indicators even though it contains relevant information such as screen viewing behaviour among school-going adolescents. Data on indicators including Active Play, Active Transportation, Sedentary Behaviours, Family and Peers, and Community and Environment were only available from the large-scale birth cohort study (i.e., GUSTO). While the 'Government' indicator was challenging to grade due to the lack of a clear benchmark, no quantitative evidence was available to assess 'Physical Fitness' and 'School' indicators. Aside, it is noted that transparent reporting of information would be valuable. For example, the 'School' indicator was not assigned a grade despite anecdotal evidence suggesting strong efforts to encourage PA in Singapore schools. This is because information relating to the percentage of schools offering the mandated amount of physical education lessons, or the percentage of schools that offer PA opportunities outside of the physical education syllabus, is not publicly available. If transparent reporting of information is difficult, policies to lower the access barrier to government data for research entities should be considered to improve surveillance and public health promotion efforts.

#### 4.1. Strengths and limitations

The stakeholder group consists of individuals from both the

government and non-government sector who has expertise in most of the areas of PA covered in the Report Card. Some of the members helped with access to relevant datasets and addressed the respective benchmarks of the indicators which could not otherwise be graded. These indicators include Organized Sport and Physical Activity, Active Play, Active Transportation, Sedentary Behaviours, Family and Peers and Community and Environment. This report also provides baseline grades, which is valuable for future comparison.

In the first Active Health Kids Singapore Report Card, 8 out of 10 indicators were assigned a grade based on the available data, and the 5 indicators mentioned in the previous paragraph were graded using proxy-report data from the GUSTO cohort study. The lack of access to nationally representative data increases the challenge of assigning grades that reflect the national situation. Other limitations include the lack of data from COVID-19-related lockdowns in Singapore which substantially affected children outdoor play levels.<sup>20</sup> Stronger and wider stakeholder engagement should also be exercised for more data access, such as with the MOE for school level data, and better surveillance efforts, such as with the Land Transport Authority Singapore for information on active transport.

## 5. Conclusion

Low PA levels and high SB are observed in children and adolescents in Singapore, despite an apparently favourable community environment and PA promoting strategies by the government. Overall, Singapore has fared well in organizing the built environment to support physical activity among the young. Singapore also has a supportive government that has supplied resources for ongoing efforts to encourage organized sports and physical activity. However, the low level of family support, active play and active transportation warrants additional public health efforts. Increased access to national survey data for both children and adolescents is critical to comprehensively evaluate PA and its indicators, especially for School and Physical fitness.

## Authorship

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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