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Germany's 2022 Report Card on Physical Activity for Children and Adolescents

Supplementary Information

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Introduction

Children and adolescents meeting the World Health Organization (WHO) guidelines on physical activity and sedentary behavior and engaging in 60 min of moderate-to-vigorous physical activity (MVPA) per day (World Health Organization, 2010) are at a lower risk of being overweight or obese, and are less likely to develop type II diabetes mellitus, metabolic syndrome, and other comorbidities than the ones being less physically active (Anderson & Durstine, 2019; Börnhorst et al., 2023; Poitras et al., 2016). Additionally, regularly active children and adolescents are more likely to have higher aerobic fitness levels and are more likely to experience positive mental health (Poitras et al., 2016). Similarly, more sedentary time is associated with unfavorable health effects (Carson et al., 2016). However, it is estimated that many young people do not fulfill this recommendation for physical activity (PA) (Aubert et al., 2018; Demetriou et al., 2019a; Guthold, Stevens, Riley, & Bull, 2020; Marques et al., 2020). Globally, in a sample of 1.6 million adolescents aged 11–17, more than 80% undertake less than one hour per day of moderate to vigorous intensity physical activity (Guthold et al., 2020). Data from Europe support this finding, indicating that about two-thirds of European adolescents aged 10–18 are not sufficiently physically active (Steene-Johannessen et al., 2020). Specifically for Germany, less than 30% of boys and girls achieve at least 60 min of MVPA daily (Finger, Varnaccia, Borrmann, Lange, & Mensink, 2018). The low global levels of PA are worrying and urge action to promote this health behavior (Cooper et al., 2015).

Initiatives aiming at promoting children's PA and reducing sedentary behavior need to be based on current data on PA and sedentary behavior levels, as well as facilitators and barriers to children's behavior in different settings. In addition, the government's strategies and investments that aim at encouraging these behaviors need to be evaluated. One way to address this knowledge translation is through the Report Card method developed by Active Healthy Kids Global Alliance (AHK Global Alliance) (Aubert et al., 2018). The Report Card is a vehicle

that advocates for initiating health-promoting programs by stakeholders, while also providing a surveillance mechanism at both the national and international levels (Tremblay et al., 2016; Tremblay et al., 2014). In the national Report Cards, grades assigned to several indicators are presented and, thus, provide an up-to-date comprehensive overview of the "state of the nation" on how children and adolescents engage in domain-specific PA and sedentary behavior and on how a country is succeeding in providing PA opportunities for children and adolescents. The world's first Global Summit on the Physical Activity of Children in Toronto involved 15 countries presenting their Report Cards (Tremblay et al., 2014). Following the success of this Summit, the AHK Global Alliance was established in 2014. During the second Global Matrix 2.0 in 2016 in Bangkok, 38 countries presented their Report Cards (Tremblay et al., 2016). The first German Report Card was presented on the Global Matrix 3.0 in Adelaide (Australia), with 49 countries participating (Demetriou et al., 2019a). The second 2022 German Report Card was presented at the Global Matrix 4.0 in Abu Dhabi (United Arab Emirates), with 57 countries participating.

Aubert et al. (2019) analyzed the global impact of the AHK Global Alliance Physical Activity Report Cards for Children and Adolescents. They concluded that an impact on raising awareness and capacity building in the scientific community was achieved. The Global Matrix and Report Card initiatives generated 149 impactful publications, 240 academic presentations, and strong media responses. In Germany, media attention has been high, too. In several TV documentations (Bayerischer Rundfunk, SAT1, Hessischer Rundfunk), print media (e.g., *Süddeutsche Zeitung, Deutsches Ärzteblatt* and *SPIEGEL*), and radio (e.g., Deutschlandfunk Kultur), the low grades from the German Report Card were presented and an emphasis was given on what is necessary to promote the PA and reduce the sedentary time of children and adolescents.

The 2022 German Report Card aims at evaluating and benchmarking the national PA promotion efforts in children and adolescents in Germany and raise awareness for promoting PA and reducing sedentary behavior. It provides updated information for numerous key audiences, such as public health, sports, and education stakeholders, school directors, teachers, parents, coaches, government ministers, and others that influence children's and adolescents' PA levels. In the 2022 German Report Card, a particular focus is given to sex/gender disparities as well as to the impact of the COVID-19 pandemic (Ciotti et al., 2020; Reimers, Schoeppe, Demetriou, & Knapp, 2018; Schlund et al., 2021a; Schlund, Reimers, Bucksch, Linder, & Demetriou, 2021b; Schmidt et al., 2020a). Based on the recommendation of the Cochrane Sex/Gender Methods Group, a subgroup of the Campbell and Cochrane Equity Methods Group, and in recognition of the theoretical and empirical entanglement of sex-based biological factors and gendered social factors, we use the term sex/gender in this manuscript (Johnson, Sharman, Vissandjée, & Stewart, 2014).

Methods

Development of Germany's 2022 Report Card on Physical Activity for Children and Adolescents

The 2022 German Report Card was developed by the Active Healthy Kids Germany research workgroup (hereinafter called AHK Germany), based on the Canadian model (Colley, Brownrigg, & Tremblay, 2012; Tremblay et al., 2014), and consisted of 26 researchers from nine universities, two research institutes, the German Association of PE Teachers, the German Olympic Sports Confederation (Deutscher Olympischer Sportbund, DOSB) and the German Sports Youth (Deutsche Sportjugend). The AHK Germany was established in 2018, initially including 16 experts, and has grown since then. In the process of the development of the 2022 German Report Card, two workshops were conducted with the members of AHK Germany.

Indicators

The AHK Germany assigned grades (A–F) to the ten core indicators of the Report Card that belong to four categories: Daily Behaviors (Overall Physical Activity, Organized Sport Participation, Nonorganized Physical Activity and Active Play, Active Transportation, Sedentary Behaviors), Individual Characteristics (Physical Fitness), Settings and Sources of Influence (Family and Peers, School, Community and Environment), as well as Strategies and Investments (Government). Some countries additionally assign grades for indicators such as Overweight/Obesity or Movement Skills that are not included in the international Global Matrix analysis. In the 2022 German Report Card, we added the indicator Overweight and Obesity, which is not among the core ten mandatory indicators, to the category Individual Characteristics.

Literature search—data sources

From January to May 2021, AHK Germany searched scientific databases such as SURF and SPORTDISCUS for relevant evidence from surveys and datasets collected in Germany addressing 6–17 year olds and their PA. Additionally, existing studies in Germany that were known to the experts of the AHK Germany due to their work and network were included. Sources included national surveys, peer-reviewed literature, government and nongovernment reports, and—for the government indicator—the World Health Organization's Health-Enhancing Physical Activity Policy Audit Tool (Bull, Milton, & Kahlmeier, 2015).

In a second stage until March 2022, due to various delays also because of COVID-19, literature searches were updated, and relevant newly published studies were included. If necessary, the grades were adapted based on the new data. Based on the AHK Global Alliance guidelines and in order to keep the Report Card up to date, surveys were included when carried out in the last 5 years. Only studies providing relevant data for a minimum sample size of 500 children and/or adolescents living in Germany were consid-

ered. Exceptions were made, however, in case no current data from the last 5 years was available (e.g., School indicator) or if previous studies stood out in terms of sample size and study quality so that this information did not seem dispensable for an adequate assessment. In addition, exceptions regarding publication year or study sample size were made if no other comparable data existed.

Grades

During the first workshop in January 2020, we clarified the key aims and defined research teams in charge of single indicators of the Report Card. The teams were responsible for identifying national studies and datasets, each study's data extraction, and the grade's first proposal. The second workshop of AHK Germany took place online in June 2021. During this workshop, we assigned grades to each of the eleven indicators once an agreement had been reached through discussion. The grades were assigned by comparing relevant survey data against an appropriate evidence-based recommendation using the grading scheme (**Table 1**) and benchmark approach from the AHK Global Alliance (**Table 2**; Barnes et al., 2016; Tremblay et al., 2016). Additionally, an asterisk (*) was added to the grade if it was based on device-measured and self-reported data. Two asterisks (**) were added if the grade was based on device-measured data exclusively. As to the indicators of daily behaviors, we assigned separate grades for girls and boys to take sex/gender differences into account. Furthermore, the influence of the COVID-19 pandemic on each indicator was indicated by adding a plus ("+") for a positive trend and a minus ("–") for a negative trend of the indicator during the pandemic.

In March 2022, the final grades were submitted for audit to AHK Global Alliance Executive Committee members to ensure that the grades were consistent with the benchmarks and grading scheme used by all 57 countries participating in the Global Matrix 4.0 (https://www.activehealthykids.org/). Thus, the submitted form included the grades and a detailed explanation of the methodology of the included studies, the type of data (self-report or device-based) and a detailed rationale explaining the set grade. The AHK Global Alliance gave feedback by two independent reviewers. This audit process led to minor changes in the grades and their rationales.

Results

The average grade of the 2022 German Report Card was "C–". **Table 2** contains the eleven indicators including their definition, their benchmarks, corresponding grades (overall and for boys and girls separately), and trends during the COVID-19 pandemic. **Table 3** presents the studies from which the data were drawn to inform the grades.

Daily behaviors

For the category of daily behaviors, all indicators were graded based on the benchmark of the proportion of children and adolescents meeting the guideline about the PA domain at hand.

Overall physical activity

Grade D– was assigned to Overall Physical Activity. Girls had lower levels of PA and received a D–, while boys received a D. In recent years, the overall PA behavior of children and adolescents living in Germany was assessed in the nationwide surveys German Health Interview and Examination Survey for Children and Adolescents (KiGGS), Motorik Modul (MoMo) Study, and Health Behaviour in School-aged Children (HBSC). In KiGGS Wave 2 (2014–2017), 12,981 children and

Abstract

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Germany's 2022 Report Card on Physical Activity for Children and Adolescents

Abstract

The German Report Card on Physical Activity for Children and Adolescents 2022 provides a summary and a comprehensive evaluation of physical activity levels and correlated indicators using the Active Healthy Kids Canada grading framework. The 2022 German Report Card, established by the Active Healthy Kids Germany (AHK Germany) expert panel, describes to what degree German youth meets the World Health Organization (WHO) guidelines on physical activity and sedentary behavior. Additionally, distal and proximal determinants, settings, as well as strategies and investments towards improvements in physical activity were analyzed by assigning grades to the eleven Report Card indicators using established benchmarks. Most children and adolescents in Germany failed to meet the WHO guidelines on physical activity and sedentary behavior and engaged in high sitting durations. Therefore, we assigned poor grades for Overall Physical Activity (D–) and slightly higher grades for Sedentary Behavior (C). Moderately positive scores were observed for specific physical activity behaviors such as Active Transportation (C) and Non-organized Physical Activity and Active Play (C–). Organized Sport Participation was the only behavioral indicator receiving a good grade (B–). Grades were moderately positive for Settings and Sources of Influence (Family and Friends: C; School: B–; Community and Environment: B–). For the indicators within the group of Individual Characteristics, we were able to assign a grade to Physical Fitness (D+), whereas the indicator Overweight and Obesity was not rated (INC). We also assigned an incomplete grade for the Government indicator due to the need for objective criteria for grading policies, indicating data gaps potentially crucial for future research.

Keywords

Health behavior · Health promotion · Monitoring · Health policy · Sedentary behavior

Table 1 Global Matrix 4.0 grading rubric

Grade	Prevalence (%)	Interpretation
A+	94–100	We are succeeding with a large majority of children and youth
A	87–93	
A–	80–86	
B+	74–79	We are succeeding with well over half of children and youth
B	67–73	
B–	60–66	
C+	54–59	We are succeeding with about half of children and youth
C	47–53	
C–	40–46	
D+	34–39	We are succeeding with less than half but some children and youth
D	27–33	
D–	20–26	
F	< 20	We are succeeding with very few children and youth
INC	–	Incomplete—insufficient or inadequate information to assign a grade

adolescents aged 3–17 provided self-reports. The findings indicate that 22.4% of girls and 29.4% of boys achieved at least 60 min of MVPA daily (a total of 26.0%) (Finger et al., 2018). In thee nationwide HBSC study Wave 2017/2018, including children aged 11, 13, and 15 years, it could be shown that 10.1% of girls and 16.9% of boys were physically active for at least 60 min per day (Bucksch et al., 2020). According to accelerometry data from the MoMo Study, on average, 30.7% of 6–17 year olds (40.9% of boys, 21.7% of girls) reach the World Health Organization (WHO) guideline of 60 min of MVPA daily (Schmidt et al., under review).

Self-reported data of the nationwide MoMo Study showed that during the first pandemic-related lockdown in Germany in the spring of 2020, the percentage of children and adolescents aged 4–17 years meeting the WHO guidelines increased from 19.6 to 31.5% (Schmidt et al., 2020a). However, this overall PA behavior change was unstable during the second lockdown in early 2021. The prevalence of reaching the WHO guideline fell below its baseline level (16.2%) (Schmidt et al., 2021).

Non-organized physical activity and active play

Grade C– was assigned to non-organized sports and active play. Girls had lower levels of non-organized sports and active play and received a D+, while boys received a C. Active play was assessed in two studies conducted in Germany within the last few years. All included studies assessed the active play behavior measured using questionnaires. In the MoMo Study, 4- to 17-year-old children and adolescents were asked whether they play outside more than three times per week. Data collection took place between 2014 and 2017, and the findings indicate that 54.9% of girls and 57.2% of boys played outside more than three times a week (Schmidt et al., 2020b). The results of the LIFE Child study in Leipzig revealed that 51.4% of adolescents aged 10–18 years indicated playing outside at least three times per week (Auhuber, Vogel, Grafe, Kiess, & Poulain, 2019).

Furthermore, we identified two studies investigating non-organized sports with self-reported questionnaires. Based on data from the MoMo Study, 36.3% of children and adolescents aged 4–17 years participate in non-organized sports, with boys being more likely to engage in these activities compared to girls (36.3% vs. 26.3%) (Schmidt et al., 2020b). In the LIFE Child study among 10–18 year olds, only 28.2% (22% girls, 34.7% boys) performed non-organized sports (Auhuber et al., 2019).

During the second COVID-19 lockdown (autumn 2020 until spring 2021), active play outdoors decreased from 53.4 to 20.6 min per day in girls and 64.6 to 24.1 min per day in boys. On the other hand, the amount of non-organized sports increased in girls from 6.3 to 9.6 min and from 6.1 to 10.3 min per day in boys (Schmidt et al., 2021).

Active transportation

Grade C was assigned to Active Transportation. There were no salient differences between boys and girls related to their active transportation; both received a C. Active transportation was assessed in three studies conducted in Germany within the last 5 years. All included studies assessed active transportation by applying questionnaires. In the MoMo Study (Reimers et al., 2021), 4- to 17-year old children and adolescents were asked about the transport mode to school. Data collection took place between 2014 and 2017, and the findings indicate that 47.9% (47.6% of girls and 48.1% of boys) of children and adolescents walked or cycled to school. The MiD Survey assessed the percentage of active travel across all ways in 6- to 17-year-old children and adolescents. Overall, 45.7% showed active travel behavior (Nobis, 2019). A regional study in a small town in the federal state North Rhine-Westphalia assessed the transport mode to school in elementary school children aged 6–10 years. In all, 49.9% indicated they travel to school actively (Scheiner et al., 2019).

During the COVID-19 pandemic, active transportation was investigated in the MoMo and the ARRIVE studies (Reimers et al., 2022; Schmidt et al., 2021). During the second lockdown (November 2020–March 2021), the MoMo Study revealed a decrease in daily walking and cycling minutes in children and adolescents (4–17 years). Before the pandemic, children and adolescents walked 30.6 min per day, and during the lockdown, it decreased to 28.0 min per day (girls: 30.7 → 27.5 min/day; boys: 30.4 → 28.4 min/day). Cycling minutes per day dropped from 8.1 min/day to 5.1 min/day (girls: 7.1 → 4.2 min/day; boys: 9.1 → 5.9 min/day) (Schmidt et al., 2021). Furthermore, the ARRIVE project (Reimers et al., 2022) investigated active transportation to four destinations in August 2021. Overall, 62.1% (girls: 57.7%; boys: 66.4%) of adolescents aged 11–15 years indicated active travel behavior.

Table 2 Grades and rationales for Germany's 2022 Report Card

Indicator/Definition	Benchmark(s)	Overall grade[a] and type of data used[b]	Grade girls 2022	Grade boys 2022	During COVID-19
Overall Physical Activity Any bodily movement produced by skeletal muscles that requires energy expenditure	% of children and youth who meet the Global Recommendations on Physical Activity for Health, which recommend that children and youth accumulate at least 60 min of moderate- to vigorous-intensity physical activity per day on average. Alternative: % of children and youth meeting the guidelines on at least 4 days a week (when an average cannot be estimated)	D–*	D–*	D*	–
Non-organized Physical Activity and Active Play Active play may involve symbolic activity or games with or without clearly defined rules; the activity may be unstructured/unorganized, social or solitary, but the distinguishing features are a playful context, combined with activity that is significantly above resting metabolic rate. Active play tends to occur sporadically, with frequent rest periods, which makes it difficult to record	% of children and youth who engage in unstructured/unorganized active play at any intensity for more than 2 h a day. % of children and youth who report being outdoors for more than 2 h a day	C–*	D+*	C*	–
Active Transportation Active transportation refers to any form of human-powered transportation—walking, cycling, using a wheelchair, in-line skating or skateboarding	% of children and youth who use active transportation to get to and from places (e.g., school, park, mall, friend's house)	C*	C*	C*	–
Organized Sport Participation A subset of physical activity that is structured, goal-oriented, competitive and contest-based	% of children and youth who participate in organized sport and/or physical activity programs	B–*	C+*	B*	–
Sedentary Behaviors (Screen Time) Any waking behavior characterized by an energy expenditure of 1 to 1.5 metabolic equivalents, while in a sitting, reclining or lying posture	% of children and youth who meet the Canadian Sedentary Behavior Guidelines (5- to 17-year olds: no more than 2 h of recreational screen time per day). Note: The Guidelines currently provide a time limit recommendation for screen-related pursuits, but not for nonscreen-related pursuits	C*	C*	C–*	–
Physical Fitness Characteristics that permit a good performance of a given physical task in a specified physical, social, and psychological environment	Average percentile achieved on certain Physical Fitness indicators (sit-ups, sit & reach, and handgrip strength) based on the normative values published by Tomkinson et al. (2018)	D+**	C–**	D+**	–
Overweight and Obesity	–	INC	INC	INC	INC
Family and Peers Any member within the family who can control or influence the physical activity opportunities and participation of children and youth in this environment	% of family members (e.g., parents, guardians) who facilitate physical activity and sport opportunities for their children (e.g., volunteering, coaching, driving, paying for membership fees and equipment). % of parents who meet the Global Recommendations on Physical Activity for Health, which recommend that adults accumulate at least 150 min of moderate-intensity aerobic physical activity throughout the week or do at least 75 min of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity physical activity. % of family members (e.g., parents, guardians) who are physically active with their kids. % of children and youth with friends and peers who encourage and support them to be physically active. % of children and youth who encourage and support their friends and peers to be physically active	C*	C*	C*	–

Table 2 (Continued)

Indicator/Definition	Benchmark(s)	Overall grade[a] and type of data used[b]	Grade girls 2022	Grade boys 2022	During COVID-19
School Any policies, organizational factors (e.g., infrastructure, accountability for policy implementation) or student factors (e.g., physical activity options based on age, gender or ethnicity) in the school environment that can influence the physical activity opportunities and participation of children and youth in this environment	% of schools with active school policies (e.g., daily physical education (PE), daily physical activity, recess, "everyone plays" approach, bike racks at school, traffic calming on school property, outdoor time). % of schools where the majority (≥ 80%) of students are taught by a PE specialist. % of schools where the majority (≥ 80%) of students are offered the mandated amount of PE (for the given state/territory/region/country). % of schools that offer physical activity opportunities (excluding PE) to the majority (> 80%) of their students. % of parents who report their children and youth have access to physical activity opportunities at school in addition to PE classes. % of schools with students who have regular access to facilities and equipment that support physical activity (e.g., gymnasium, outdoor playgrounds, sporting fields, multipurpose space for physical activity, equipment in good condition)	B–*	B–*	B–*	–
Community and Environment Any policies or organizational factors (e.g., infrastructure, accountability for policy implementation) in the municipal environment that can influence the physical activity opportunities and participation of children and youth in this environment	% of children or parents who perceive their community/municipality is doing a good job at promoting physical activity (e.g., variety, location, cost, quality). % of communities/municipalities that report they have policies promoting physical activity. % of communities/municipalities that report they have infrastructure (e.g., sidewalks, trails, paths, bike lanes) specifically geared toward promoting physical activity. % of children or parents who report having facilities, programs, parks, and playgrounds available to them in their community. % of children or parents who report living in a safe neighborhood where they can be physically active. % of children or parents who report having well-maintained facilities, parks, and playgrounds	B–*	B–*	B–*	–
Government Any governmental body with authority to influence physical activity opportunities or participation of children and youth through policy, legislation or regulation	Evidence of leadership and commitment in providing physical activity opportunities for all children and youth. Allocated funds and resources for the implementation of physical activity promotion strategies and initiatives for all children and youth. 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)	INC	INC	INC	INC

PE physical education, *COVID-19* coronavirus disease 2019
[a]See **Table 1** for the grading scheme
[b]One "*" was added to the grade if it was based on device-measured and self-reported data and two "**" were added if the grade was based on device-measured data exclusively

To and from school, the prevalence was around 47.4% (girls: 44%; boys: 50.8%), whereas, to friends, 67.8% of girls and 77.8% of boys travelled actively. Overall, 73.5% (67.4% of girls and 79.5% of boys) travel actively to shopping places. Regarding recreational activities, 65.3% of girls and 73.2% of boys walked or cycled to this destination.

Organized sport participation

Organized sports participation was graded with B–. As girls are involved in organized sports activities in slightly lower proportions than boys, the grade C+ was assigned to them, while boys received a B. Several studies have assessed sports club membership or participation in childhood and adolescence based on large-scale samples representative for specific age groups. All surveys used questionnaires for data collection.

KiGGS indicated that 61% of 12- to 16-year-old adolescents participate in organized sport (girls: 57%, boys: 65%) (Manz, Krug, Schienkiewitz, & Finger, 2016). The MoMo Study found a participation rate in sports clubs of 65% for adolescents in secondary schools (girls: 59%, boys: 72%) (Reimers, Schmidt, Demetriou, Marzi, & Woll,

Table 3 Surveys used to inform each of the grades assigned to each indicator of the 2022 Activity Report Card

Survey	Data assessment method	Age	*N*	Indicator(s) no.
MoMo (Wave 2) (2003–2006) Nationally representative	Survey specific questionnaire (MoMo-PAQ and accelerometry: Actigraph GT3X+)	4–17 years old	4528	Overall PA Organized Sport Active Play Active Transportation Sedentary behavior Physical Fitness
MoMo (Wave 1) (2009–2012) Nationally representative	Survey specific questionnaire (MoMo-PAQ)	4–17 years old	8522	Family and Peers School
KiGGS (Wave 0 + 1) (2003–2006 + 2009–2012) Nationally representative	Survey specific questionnaire (MoMo-PAQ) Parent report up to 11 years and self-report from the age of 11 years	6–16 years old	3505	Organized Sport
KiGGS Wave 2 (2014–2017) Nationally representative	Survey specific questionnaire (MoMo-PAQ)	3–17 years old	15,023	Overall Physical Activity Community and Environment
Kinderreport (2020) Nationally representative	Only self-report data	10–17 years old Adults (18 years and older)	624 1022	Community and Environment
HBSC Study (2017/2018) Nationally representative	HBSC questionnaire (similar to KiGGS)	11, 13, and 15 years old	4299	Overall Physical Activity
HBSC school directors (2009–2010) Nationally representative	Self-report data	–	273 school directors	School
AID:A (2014) Nationally representative	Survey specific questionnaire	7–18 years old	6765	Organized Sport and Physical Activity
National Education Panel Study (2015)	Self-report data	School class 9	16,238	Organized Sport and Physical Activity
LIFE Child study (2019) Regional (Leipzig)	Survey specific questionnaire	10–18 years old	1449	Active Play
MiD (2019) nationwide data	Survey specific questionnaire	6–17 years old	> 300,000	Active Transportation
Scheiner, Huber, and Lohmüller (2019) Regional (Lünen, North Rhine-Westphalia)	Survey specific questionnaire	6–10 years old	1064	Active Transportation
Fuldaer Bewegungs-Check (2014–2020) Representative for Fulda	Endurance (6 min run), Flexibility (stand & reach), Strength (hand strength, push-ups, sit-ups), and Coordination (balancing, jumping sideways)	7–9 years old	3527	Physical Fitness
KOMPASS-2-Studie Leipzig (2014–2018) Representative for Leipzig	Endurance (6 min run), Flexibility (stand & reach), Strength (push-ups, sit-ups), and Coordination (balancing, jumping sideways)	7–10 years old	3798	Physical Fitness
Fitness-Barometer Baden-Württemberg (2012–2018) Representative for Baden-Württemberg	Endurance (6 min run), Flexibility (stand & reach), Strength (push-ups, sit-ups, broad jump), Coordination (balancing, jumping sideways)	6–10 years old	6266–6563	Physical Fitness
Motorische Tests für NRW (2015–2018) Representative for NRW	Endurance (6 min run), Flexibility (stand & reach), Strength (push-ups, sit-ups) Coordination (balancing, jumping sideways)	9–10 years old	15,139	Physical Fitness
EMOTIKON-Projekt (2015–2019) Representative for Brandenburg	Flexibility (Stand & reach), endurance (6 min run)	8 years old	18,434	Physical Fitness
LIFE Child Leipzig (2015–2019) Representative for Leipzig	Flexibility (stand & reach, sit & reach) Strength (push-ups), Coordination (balancing, jumping sideways)	6–10 years old	915	Physical Fitness
Fitness Olympics Cologne (2015–2019) Representative for Cologne	Flexibility (stand & reach), Strength (sit ups), Coordination (jumping sideways)	6–10 years old	7752	Physical Fitness

Table 3 (Continued)

Survey	Data assessment method	Age	*N*	Indicator(s) no.
Berlin hat Talent (2015–2020) Representative for Berlin	Endurance (6 min run), flexibility (stand & reach), Strength (push-ups, sit-ups), Coordination (balancing, jumping sideways)	6–10 years old	39,563	Physical Fitness
Mutz and Albrecht (2017) Regional (Göttingen)	Self-report data	8 years old	150	Family and Peers
Family and Health-Study (2014) Regional (Konstanz)	Self-report data	14 years old	198	Family and Peers
Schoeppe et al. (2016) Regional (Göttingen)	Self-report data	11 years old	737	Family and Peers
Healthy Boat (Erkelenz) (2014) Regional (Ulm)	Self-report data	7 years old	1875	Family and Peers
AOK Familien-Studie (2018) Nationally representative	Self-report data	4–14 years old	4896	Family and Peers

PA physical activity, *KiGGS* German Health Interview and Examination Survey for Children and Adolescents, *MoMo* Motorik Modul Study, *AID:A* Aufwachsen in Deutschland, *MiD* Mobilität in Deutschland, *NRW* Nordrhein-Westfalen (North Rhine-Westphalia), *AOK* Allgemeine Ortskrankenkasse, *HBSC* Health Behaviour in School-aged Children

2019). Furthermore, another study, also based on MoMo data, reports that 11- to 13-year old boys accumulate 136 min of PA in sport clubs, while girls achieve 101 min (Schmidt et al., 2020b). In the AID:A wave of 2014, a sports club membership rate of 59% was found (authors' calculations based on the AID:A 2014 Scientific Use File). An additional online survey, also conducted within the AID:A project, came to quite similar findings: 60% of 13- to 17-year-olds were sports club members (girls: 56%, boys: 64%) (Burrmann, Seyda, Heim, & Konowalczyk, 2016). Across age groups, more boys than girls are sports club members.

With regard to children, the level of sports club membership is slightly higher. According to data from the MoMo Study on elementary school children, 67% hold a membership in a sports club (girls: 63%, boys: 71%) (Reimers et al., 2019). The most recent data for children and adolescents combined (4–17 years) are published based on the 2020 MoMo Study and indicate that 60% are sports club members in that age group (Schmidt et al., 2020b).

Overall, studies report that 59–65% of adolescents and 65–72% of children participate in club-organized sports. In addition to survey data, sports club membership data of children and adolescents are published annually by the German Olympic Sports Confederation, based on recorded membership. When put in relation to population data, these statistics also reveal that roughly two-thirds of 6- to 17-year-old children and adolescents are sports club members.

During the lockdowns, organized sports activity could not be pursued because the respective sports facilities were closed. During those periods, the level of sporting activities obviously decreased (Schmidt et al., 2020a). Registered sports club memberships among children suggest that sports club membership may have decreased by up to 17% from 2019 to 2020 (Deutscher Olympischer Sportbund, 2021). However, these numbers are provisional, and attributing this decline solely to the pandemic is inappropriate (Thieme & Wallrodt, 2022).

Sedentary behaviors

Grade C was assigned to Sedentary Behavior. Boys had higher levels of sedentary time and received a C–, while girls received a C. In recent years, several national studies captured the sedentary behavior of children and adolescents in Germany. Nevertheless, only the national representative MoMo Study provided data that allowed an interpretation of the above-stated benchmark (Schmidt et al., 2020a). In the other national studies, a distinction between sedentary time and screen time was impossible because only device-based data (e.g., accelerometer and acivPAL) was available without providing an indication of the content of the activity while sitting. In these studies, a differentiation of sedentary time during recreational activities and others (e.g., school-related activities) was impossible. Therefore, these studies were not included in our analysis. The MoMo Study collected self-report data from 2014 until 2017 (Wave 2) and during the two lockdowns of the COVID-19 pandemic in 2020. The findings before the pandemic show that 43.9% of boys and 50.6% of girls fulfill the guidelines and spend less than 2 h per day being sedentary, watching TV, or using other screen devices. During the COVID-19 lockdown, recreational screen time increased significantly, with only 30.2% of boys and 31.1% of girls reaching the recommendation of no more than 2 h of recreational screen time per day (Schmidt et al., 2021).

Individual characteristics

Physical fitness

Grade D+ was assigned to Physical Fitness. Girls received a C– compared with peers from other countries. Boys performed slightly lower and achieved only a D+ in international comparisons (Tomkinson et al., 2018).

Four fitness components were reviewed: endurance, strength, flexibility, and coordination. A total of eight test items were used to assess these

fitness components: cardiorespiratory endurance (6 min run), flexibility (stand & reach, sit & reach), strength and muscular endurance (handgrip strength, push-ups, sit-ups), and coordination (balancing, jumping sideways). The test results of the German children were compared with the European norm values for fitness parameters of children and adolescents aged 9–17 years (Tomkinson et al., 2018). Since the test items used in Germany do not entirely overlap with the test tasks used in other European countries, a direct classification of the scores could only be made for the test items handgrip, sit-ups, and sit & reach. However, in Germany, the test task of sit-ups is performed for 40 s, not for 30 s, as described by Tomkinson et al. (2018). Therefore, a linear approximation of the raw values was performed. Sit & reach as well as stand & reach values were combined in the classification. Handgrip values could be classified without prior adjustment. Therefore, only the percentiles of these three test tasks were finally used to classify the present German 2022 Report Card.

Based on various regional and nationwide studies, a good overview of physical fitness throughout Germany can be discerned, including nine studies: MoMo Study (Hanssen-Doose et al., 2021; Niessner et al., 2020), Fuldaer Bewegungscheck (Hohmann, Fehr, Siener, & Hochstein, 2017; Siener & Hohmann, 2019), KOMPASS-2-Study Leipzig (Speer et al., 2021; Streicher, Wulff, Hartmann, Witt, & Wagner, 2017), Fitness-Barometer Baden-Württemberg (Kloe, Niessner, Daubenfeld, & Bös, 2020a; Kloe, Oriwol, Niessner, Worth, & Bös, 2020b), Motorische Tests für NRW (Roth, Moll, Seidel, & Bös, 2021), EMOTIKON-Project (Golle, Muehlbauer, Wick, & Granacher, 2015), LIFE Child Leipzig (Wessela et al., 2022), Fitness-Olympiade Köln (Graf, 2020), and Berlin hat Talent (Zinner, Becker, Heinicke & Lange, 2018; Zinner, Utesch, Büsch, & Bortel, 2020). For the Report Card grading, "Motorische Tests für NRW" as well as EMOTIKON-Project were not included due to the missing percentile based on Tomkinson et al. (2018). Based on the Eurofit percentiles (Tomkinson et al., 2018), children aged 9 and 10 years in Germany were classified with low physical fitness levels as they reached the 39.3th percentile over all test items. Detailed data related to the representative physical fitness percentiles for children in Germany can be found in supplementary Table 1.

During the COVID-19 pandemic, field testing of physical fitness was not possible and therefore self-reports on perceived fitness levels were used to screen physical fitness. In these reports, 38.2% of children and adolescents stated that their physical fitness had deteriorated (Schmidt et al., 2021). However, 12.8% of the interview participants also stated that their physical fitness had improved. The current state of research in Germany is heterogeneous, and only a few objectively measured data are available. A regional study in southwest Germany (Baden-Württemberg) in 2020 (Eberhardt, Bös, & Niessner, 2022) showed no evidence of a negative short-term effects of the COVID-19 pandemic on physical fitness in children between the ages of 7 and 9 years.

Overweight and obesity

Altogether, it was not possible to grade the indicators Overweight and Obesity because the criteria for the assessment of overweight (including obesity) vary between underlying national reference systems, and benchmarks for the evaluation of this indicator have not been established yet. Although overweight (including obesity) is traditionally characterized by body mass index (BMI), which is defined as body mass in kg divided by height $(m)^2$, the criteria for the assessment of BMI vary between countries. In Germany, overweight (including obesity) is traditionally defined as a BMI above the 90th percentile, as published by Kromeyer-Hauschild, Moss, and Wabitsch (2015); (Kromeyer-Hauschild et al., 2001). Although international cut-offs have been suggested, using national reference data is common in clinical and pediatric practice in Germany, as in many other countries.

Data on the prevalence of overweight and obesity were extracted from previously published data from HBSC (HBSC-Studienverband Deutschland, 2015) and CresNET (Geserick et al., 2018). For KiGGS Wave 2 (Schienkiewitz, Brettschneider, Damerow, & Rosario, 2018), data were obtained via personal communication from one of the authors (Anja Schienkiewitz). Among the selected studies, only the KiGGS Study was designed to be representative for the German population (3–17 years). Data from the KiGGS Wave 2 included standardized height and weight measurements in 1143 children between 6 and 10 years and 1771 children between 11 and 17 years. Data are weighted by age, sex, state, nationality, and education. Prevalence of overweight (including obesity) ranged between 13.6% (girls aged 6–10 years) and 19.6% (boys aged 11–17 years). In the HBSC Study, which includes self-reported BMI data from 4859 children and adolescents between 11 and 15 years, the prevalence of overweight was 8.9% among boys and 7.7% among girls. CresNet compiles data from pediatricians in the Leipzig region and around Germany and includes 53,559 data points between ages 6 and 10 years and 153,367 data points between ages 11 and 18. The prevalence of overweight was 15.5% (6–10 years) and 20.4% (11–18 years).

An increased BMI in response to the COVID-19 pandemic has been reported across all age groups and weight categories (Vogel et al., 2022).

Settings and sources of influence

Family and peers

For the indicator family and peers, grade C was given. It was not possible to address sex/gender differences based on the currently existing studies. However, a significant difference was observed depending on children's age, with more parents being physically active with their younger children than older ones. Additionally, parental support decreases with age.

The benchmarks of the indicator were addressed in five national studies, of which two were small regional studies with 150 and 198 families (Mutz & Albrecht, 2017; Niermann, Krapf, Renner, Reiner, & Woll, 2014) and three studies including 737 to 4896 children

and parents, respectively (AOK, 2018; Erkelenz et al., 2014; Schoeppe, Röbl, Liersch, Krauth, & Walter, 2016). All studies used subjective measures but differed in the use of child vs. parent reports. Age composition in these studies is very heterogeneous (6–17 years). Depending on the study and age group investigated, between 27 and 57% of parents were physically active with their children and/or adolescents (AOK, 2018; Mutz & Albrecht, 2017; Niermann et al., 2014). Parental support for children's and adolescents' PA varies between 50 and 88%, and the percentage of parents who meet recommendations varies between 21 and 58% (Erkelenz et al., 2014; Mutz & Albrecht, 2017; Niermann et al., 2014; Schoeppe et al., 2016). The extensive ranges are at least partly due to differences in children's age, as engaging in physical activities together with the child and parental support decreases as children grow older. No reviewed study reported the prevalence of friends' support. No data was found on a possible pandemic/lockdown-related change in family and peer support/PA.

School

Grade B– was assigned to the setting of schools. The included studies did not indicate salient differences between girls and boys. An evaluation of the benchmarks was only partly possible based on the existing data. We identified two studies that were relevant to this indicator:

Using data from the MoMo Study (Wave 1), on average, 2.6 lessons per week are taught and distributed over 1.8 days (Hanssen-Doose, Albrecht, Schmidt, Woll, & Worth, 2018). About 20–35% of the participating students assess PE as "akinetic" and "little exhausting" (Hanssen-Doose et al., 2018). Regarding extracurricular activities, 20–25% of students participate in project teams. Based on data from the nationally representative HBSC school directors survey, 20% of schools incorporated PA as an element of their school program over the year (Dadaczynski, Bucksch, & Paulus, 2016) in the course of an increasing number of all-day schools (Stibbe & Ruin, 2020). Regarding facilities, nearly all schools (97.9%) have a gym, 71.8% have a PA-friendly playground, 64.7% have an athletic field, and 19.7% have an (indoor) swimming pool. Furthermore, 42% of schools have a specific focus or profile on health promotion (Dadaczynski et al., 2016).

During the overall time period of the COVID-19 pandemic, PE did not take place to a great extent and online teaching modules were only scarcely provided (Opper, Worth, & Woll, 2021). Implementation varied significantly among individual teachers, ranging from highly positive and innovative PE strategies to a complete absence of physical education teaching.

Community and environment

Overall, Community and Environment received a grade of B–. The included studies did not show salient differences between girls and boys. Two representative studies were identified as relevant for this indicator.

In the "Kinderreport 2020" (Kinderhilfswerk eV, 2018), 22–35% of the participating children and adolescents aged 10–17 years ($n = 624$) expressed concerns about suitable places to play in their neighborhood, dangerous traffic, fear of other children and adolescents or adults when playing outside, as well as feeling unsafe because of dangerous objects or dark routes. Adults' ($n = 1022$) perception of conditions for children and adolescents playing outside was worse: 36–65% had concerns about the same items. While adults perceived other children and adolescents as the biggest problem, children and adolescents perceived dangerous traffic as the biggest obstacle to playing outside. Overall, children's and adolescents' perceptions of playing outside were worse compared to the same survey conducted in 2018. Furthermore, the situation for children and adolescents was rated better in rural than in urban areas by both children and adolescents and adults.

In KiGGS Wave 2 (2014–2017) (Krug, Finger, Lange, Richter, & Mensink, 2018), 13,568 children and adolescents aged 3–17 years were interviewed about their PA environment. For children up to 10 years of age, parents answered the questions about the PA environment. Among children up to 10 years, 75.6% of girls and 79.3% of boys reported a sports field in their neighborhood, 47.6% of girls and 49.8% of boys reported a swimming pool, and 77.5% of girls and 77.0% of boys reported a park or green area. Children and adolescents aged 11–17 years reported more opportunities for sport and physical activities in their communities: 85.3% of girls and 88.3% of boys reported having a sports field in their neighborhood, 62.9% of girls and the same percentage of boys reported having a swimming pool, and 84.6% of girls versus 82.6% of boys reported having a park or green space. Overall, children and adolescents aged 10 and over were more likely than younger children to perceive opportunities for physical activity in their neighborhood.

Strategies and investment (government)

The indicator Government refers to national policy and was given an "inconclusive" grade due to the lack of objective criteria for grading policies.

There is evidence of leadership, as the Federal Ministry of Health is responsible for PA promotion, supported by its federal agencies; it involves other relevant stakeholders in strategy development through the 'Working Group Physical Activity Promotion in Daily Living' (Gelius et al., 2021; Messing, Forberger, Woods, Abu-Omar, & Gelius, 2022). In an expert survey, 77% of respondents confirmed political commitment to PA promotion in Germany but highlighted differences between sectors (Messing et al., 2022). Funds and resources are allocated across several political sectors; key funding sources are the Prevention Act, with over 500 million euro/year (not exclusively for PA promotion) and the Funding Priority Physical Activity with 4.6 million euro for 2019–2022 (Messing et al., 2022).

Progress in the key stages of policymaking resulted in increased development of policies promoting PA. According to a survey among members of the Federal Ministry of Health's working group 'physical activity promotion in everyday life', key developments in the past years were the development of

National Recommendations for Physical Activity and Physical Activity Promotion, research funding offered by federal ministries, the adoption of the Prevention Act, and the National Action Plan IN FORM (Messing et al., 2022). In addition, the National Cycling Plan is considered a key policy document on PA promotion (Messing et al., 2022). However, institutional structures and processes within government and civil society are perceived as a significant challenge for implementation and policy adoption (Messing et al., 2022; Wäsche, Peters, Appelles, & Woll, 2018).

In response to the COVID-19 pandemic, the government adopted the programs 'Catching Up after COVID for Children and Adolescents' (*Aktionsprogramm Aufholen nach Corona für Kinder und Jugendliche,* 2021/22, budget of 2 billion euro) and 'The Future Package for Physical Activity, Culture and Health' (*Zukunftspaket für Bewegung, Kultur und Gesundheit,* 2023, budget of 55 million euro). Parts of these budgets are invested in PA promotion, e.g., to support the organized sports sector (BMFSFJ, 2022, 2023).

Discussion

Germany's 2022 Report Card on Physical Activity in Children and Adolescents is the second Report Card from Germany, following the first from 2018 (Demetriou et al., 2019a). The overarching aim of the 2022 Report Card is to evaluate and benchmark the national PA promotion efforts in children and adolescents in Germany and to raise awareness for the promotion of PA and the reduction of sedentary behavior. In this Report Card, a particular focus has been given to sex/gender disparities as well as to the impact of the COVID-19 pandemic. This research is crucial as effective programs and policies to enhance PA levels in children and adolescents can only be developed based on adequate information transport.

In Germany, based on the included studies to evaluate the 11 indicators of the Report Card (**Table 3**), most children and adolescents failed to meet the global recommendations for PA, show low levels in different types of PA such as active travel and non-organized PA and engage in high levels of sedentary behaviors. In an international comparison with the 56 participating countries in the Global Matrix 4.0, Germany takes up a middle position regarding the behavioral indicators and a higher position in the sources of influence (Aubert et al., 2022).

The 2020 WHO guidelines on PA and sedentary behavior update the 2010 WHO recommendations. In the new guidelines, it is emphasized that an average of 60 min/day of moderate-to-vigorous intensity aerobic PA across the week provides health benefits in children and adolescents. In comparison to the previous guidelines, it is not mandatory to fulfill 60 min of PA daily as long as the average over the entire week is sufficient (Bull et al., 2020). Specific PA guidelines during school hours still do not exist. In Germany however, every state has developed its table of compulsory weekly physical education lessons for each grade and this can be regarded as a guidance for implementing a minimum PE quantity standard. Saunders et al. (2022) developed international school-related sedentary behavior recommendations for children and adolescents emphasizing that a healthy day includes breaking up extended periods of sedentary behavior and incorporating different types of movement into homework whenever possible, while limiting sedentary homework. School-related screen time should be pedagogically meaningful and enhance learning. Overall, whenever possible movement-based learning activities and non-screen-based learning activities should be preferred. In the process of developing the German Report Card we were faced with the challenge that PA data in the included studies were based on the old PA recommendations and could only partly be interpreted based on the new recommendations. In addition, on an international level the use of the current PA recommendations varies and makes the comparison of the overall PA indicator difficult.

Furthermore, regarding the indicator Sedentary Behavior, several relevant studies had to be excluded from the German Report Card as a distinction between sedentary time and screen time was impossible because only device-based data (e.g., accelerometer and activPAL) was available without providing an indication of what children and adolescents were actually doing while sitting. In these studies, a differentiation of sedentary time during recreational activities and other (e.g., school-related activities) was not possible. Overall, the preparation of the Report Card for Germany made clear that the data base for the physical activity behavior of children and adolescents could be improved. A comprehensive and continuous monitoring of physical activity behavior on the population level would be an adequate basis for policy makers and practitioners to promote PA in children and adolescents.

Sex/gender has been identified as an essential variable of influence for several health behaviors (Demetriou et al., 2019b). Recent international research shows a gap, with girls being consistently less active across all age groups (Guthold et al., 2020; Steene-Johannessen et al., 2020). This finding could be confirmed in the current Report Card for Germany, where girls received lower grades in the following indicators: Overall Physical Activity, Organized Sports Participation, as well as Non-organized Physical Activity and Active Play. However, boys received a poorer grade in Sedentary Behaviors and Physical Fitness. Differences between girls and boys can be explained by biological (sex) as well as social (gender) mechanisms including sport-related gender stereotypes (Plaza, Boiché, Brunel, & Ruchaud, 2017) and socially determined gender roles (West & Zimmermann, 1987), body image concerns (Matheson et al., 2023) as well as lack of support and role models (Midgley, DeBues-Stafford, Lockwood, & Thai, 2021). In the aggregate, social and cultural norms, biological mechanisms and genetic dispositions contribute to the differences between girls and boys (Telford, Telford, Olive, Cochrane, & Davey, 2016).

Most of the included studies analyze data collected before the COVID-19 pandemic. Nevertheless, we included an additional category revealing the direction of the impact though the COVID-

19 pandemic on each reviewed indicator. Overall, it becomes evident that the COVID-19 pandemic and, most notably, the lockdown periods have negatively influenced all indicators to which relevant data was available (Beck, Siefken, & Reimers, 2022). The relatively high PA levels including unstructured time outdoors during the first lockdown were a short period due to the among other things the closed schools and homeschooling not established yet and the arrival of spring with good weather conditions. Although it seems likely that sports clubs and organizations can regain their important position for children and adolescents, there is still a lack of robust data to predict the pandemic's short- and long-term effects on sports club memberships.

Overall, more research is needed on several indicators to increase the validity of the given grades. Regarding the indicator Sedentary Behavior, there is a need to capture better the time children and adolescents spend sedentary during recreational time. Regarding Organized Sport Participation, the grading largely neglected organized sports activities in settings other than clubs (e.g., sports-related extracurricular activities and fitness centers). In the future, it needs to illustrated whether sports contexts (such as clubs, extracurricular activities, and fitness centers) reach similar groups or other groups. In the latter case, the grade assigned to Organized Sports may underestimate the proportion of children and adolescents active in organized sports settings (Sprengeler, Buck, Hebestreit, Wirsik, & Ahrens, 2019). As to the indicator School, a comprehensive study is needed to capture the current status of the quantity and quality of PE delivered and other PA components, such as active recess delivered during school hours. Only a few recent studies providing new data on the indicator Family and Peers were published in the last years, and results vary greatly. Furthermore, and similar to 2018, no studies addressing the influence of peers on children's PA were available. There is a lack of studies that take a differentiated perspective (e.g., regarding the relevance of children's age and the role of mothers and fathers) on investigating family/peer influence on children's PA. Regarding the indicator Community and Environment data on younger children are lacking as the primary source of data is gained from the "Kinderreport 2020" study that includes children and adolescents aged 10–17 years.

Improving *benchmarks and grading* is an essential issue in the Report Card methodology. For example, the benchmark of Active Transportation does not consider the frequency of active transportation to and from places, which is also important regarding the prevalence of active transportation and its health benefits. To be able to estimate whether the low performance in the Physical Fitness indicator also has an impact on the health situation of the participants, criterion-related norm values should be developed. The classification in relation to other European countries is problematic because different tasks/age ranges were used. The European classification (Tomkinson et al., 2018), including handgrip, sit-ups, and sit & reach, could be roughly done with conversions. Although not an original indicator of the Global Matrix 4.0, Overweight and Obesity status is bidirectionally associated with PA and sedentary behavior and is of high public health priority (Sprengeler et al., 2021). Although there is sufficient data on weight status in most countries, grading has proven challenging because national reference data are commonly used in Germany and other countries. Therefore, internationally comparable criteria for grading Overweight and Obesity have yet to be defined. For the Government indicator, the lack of a standardized grading process results in limitations. Discussing policy success and failure and how to account for direct, indirect, or spill-over effects is highly controversial. Furthermore, political systems vary greatly, and there needs to be an agreement on how centralized versus federal political systems should be treated in the grading process. To standardize the grading process for this indicator, future Report Cards might utilize the scoring rubric developed in Wales (Ward et al., 2020) or further develop this methodology based on recently developed policy benchmarking tools such as the Physical Activity Environment Policy Index that has been developed to assess the level of implementation of policies for physical activity promotion (Woods et al., 2022).

Limitations

The grading in the 2022 German Report Card might be influenced by the participants' literature searches and their scientific knowledge and experience. Publication bias may exist as studies with favorable results are more often published, and AHK Germany does not have full access to unpublished data existing in Germany. Regarding some indicators, no data was available at all that could be used to grade the respective indicators. Furthermore, known sources of inequalities like socioeconomic status, residence area (urban vs. rural) and disabilities have not been addressed in our Report Card. These factors are shown to be related to PA and sedentary behavior and some other countries provided disaggregated data with regards to sex/gender, age, residence area and disabilities (Silva et al., 2022). Additionally, a Global Matrix on Para Report Cards was published (Ng et al., 2023). However, due to limited data on these inequalities as well as limited capacities we only considered differences with regard to sex/gender, age and COVID-19 trends. An additional difficulty in the current Report Card was assessing the impact of the COVID-19 pandemic. This was realized based on a few studies that describe specific time points during the pandemic but do not suffice to evaluate long-term effects.

Conclusions

Germany's 2022 Report Card is the only report available for Germany, which includes an overall evaluation of domain-specific physical activity (PA) behaviors in children and adolescents. In addition, the Report Card includes settings and governmental conditions that influence these behaviors and is a vehicle to promote PA and reduce sedentary behavior in children and adolescents in Germany. It is a valuable resource that can be

used by public health stakeholders such as teachers, parents as well as political decision-makers, nongovernmental organizations (NGOs) and academics, and others who can promote children's and adolescents' PA levels. During the Global Matrix 4.0, the Report Cards of 57 countries from all over the world were presented. This comparison can lead to a better understanding of the strengths and weaknesses of PA promotion in children and adolescents in Germany. Despite favorable settings and sources promoting PA and reducing sedentary behavior levels, few children and adolescents in Germany meet the WHO PA and screen time guidelines. Governmental action should establish a comprehensive strategy to ensure equitable opportunities for physical activity participation among all children and adolescents, irrespective of socioeconomic status or gender.

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Declarations

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For this article no studies with human participants or animals were performed by any of the authors. All studies mentioned were in accordance with the ethical standards indicated in each case.

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