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REVIEW ARTICLE

Physical Fitness of College Students in China: Evidence Mapping and Gap Analysis through a Scoping Review

CUI WENDI[1], ARIMI FITRI MAT LUDIN[2]*, LI HAO[3,4], NOR M. F. FARAH[5]

[1]Center for Healthy Ageing & Wellness, Faculty of Health Sciences, Universiti Kebangsaan Malaysia. 50300 Kuala Lumpur, Malaysia
[2]Center for Healthy Ageing & Wellness & Programme of Biomedical Science, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, 50300 Kuala Lumpur, Malaysia
[3]Center for Healthy Ageing & Wellness, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, 50300 Kuala Lumpur, Malaysia
[4]Nan Hang Secondary School, 210000 Nanjing, Jiangsu Province, China
[5]Center for Healthy Ageing and Wellness, Faculty of Health Sciences, Universiti Kebangsan Malaysia, 50300 Kuala Lumpur, Malaysia
**Correspondence: arimifitri@ukm.edu.my; Tel: +603 92898043*

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ABSTRAK

Kecergasan fizikal dalam kalangan pelajar kolej di China sentiasa menjadi perhatian utama pihak kerajaan China. Dalam beberapa tahun kebelakangan ini, tahap kecergasan fizikal pelajar kolej di China menunjukkan penurunan yang berterusan. Keadaan ini memerlukan tindakan afirmatif yang segera untuk menanganinya. Oleh itu, ulasan skop ini bertujuan untuk menilai secara sistematik bukti sedia ada berkaitan status kecergasan fizikal pelajar kolej di China pada masa kini. Carian sistematik telah dijalankan dalam tiga pangkalan data utama berkaitan kecergasan fizikal pelajar kolej di China, melibatkan satu atau lebih komponen kecergasan fizikal berkaitan kesihatan, bagi merumuskan tahap kecergasan fizikal semasa mereka. Sebanyak 34 artikel telah dimasukkan dalam ulasan ini. Kajian terdahulu menunjukkan bahawa tahap kecergasan fizikal mahasiswa di China masih kurang memuaskan. Walaupun indeks jisim badan kebanyakan mahasiswa berada dalam julat normal, obesiti berat badan normal (normal-weight obesity, NWO) masih berleluasa. Mahasiswa dengan NWO mempunyai peratus lemak badan yang tinggi serta jisim otot rangka yang rendah, iaitu keadaan "berat badan normal tetapi lemak badan tinggi dan jisim otot rendah". Selain itu, kecergasan kardiorespiratori majoriti mahasiswa hanya berada pada tahap lulus, manakala hanya sebilangan kecil mencapai tahap cemerlang dan sebahagian masih gagal memenuhi piawaian minimum. Dapatan daripada kajian ini boleh dijadikan sebagai amaran kepada pihak berkuasa yang berkaitan. Tindakan afirmatif pada masa hadapan harus mengambil kira faktor-faktor berkemungkinan yang telah dikenal pasti dalam kajian ini. Dapatan ini juga menjadi asas penting bagi penyelidikan berkaitan pada masa hadapan.

Kata kunci: *China; kecergasan fizikal; pelajar kolej*

ABSTRACT

The physical fitness of Chinese college students has always been a key concern of the Government of China, especially due to the consistent decline in recent years, prompting an urgent need for affirmative actions to mitigate this situation. Thus, this scoping review aims to systematically appraise existing

evidence regarding the current physical fitness status of college students in China. A systematic search was conducted on the physical fitness of Chinese college students in three databases (PudMed, Scopus and WoS), including 34 articles that evaluated one or more health-related physical fitness components to summarise the current physical fitness status among Chinese college students. Existing research indicates that the physical fitness status of Chinese college students is relatively poor, such as college students' body mass index falls within the normal range, however, normal weight obesity (NWO) is prevalent. Students with NWO show excessive body fat percentage and insufficient skeletal muscle mass, reflecting the condition of "normal weight but high body fat and low muscle mass". Most students exhibit cardiorespiratory fitness at a passing level, with relatively few reaching the excellent standard, and a certain proportion remaining below the passing threshold. According to all the 34 articles, eight major factors influence the physical fitness of college students, with lack of exercise identified as the primary factor. Current research on health-related physical fitness among Chinese college students remains limited. Future studies should improve methodological rigor, data timeliness and research depth to provide more robust scientific evidence for policy development and practical interventions.
Keywords: College student; Chinese; physical fitness

INTRODUCTION

The college period represents a transitional stage from adolescence to adulthood and serves as a crucial phase for establishing healthy lifestyles and adopting positive health behaviors (Niedermeier et al. 2018). However, evidence suggests that college students worldwide commonly engage in unhealthy lifestyles, characterised by insufficient physical activity, prolonged sedentary behaviour, unbalanced nutrition and irregular sleep patterns such as staying up late, all of which collectively pose significant risks to their physical health (Kubieva et al. 2019; Tafireyi & Grace 2021). The World Health Organisation's 2020 Guidelines on Physical Activity and Sedentary Behaviour emphasise that promoting health requires not only achieving the recommended levels of weekly physical activity, but also reducing sedentary behaviour (Bull et al. 2020).

Health-related physical fitness refers to a set of physical attributes associated with the prevention of diseases and the promotion of overall health and well-being. It encompasses cardiorespiratory endurance, muscular strength, muscular endurance, flexibility and body composition (Chen et al. 2020). The 2021 National Physical Fitness Monitoring Bulletin reported that compared to 2014, the physical fitness of college students continued to show a downward trend, with physical fitness indicators, such as speed, explosive power and endurance declining in boys aged 19-22 (Deng et al. 2023). Based on the analysis of national student physical fitness and health survey data from 2000 to 2019, the median Physical Fitness Index of Chinese college students declined significantly from -0.16 in 2000 to -1.99 in 2019, with the rate of decline being faster in male students than in female students (Cai et al. 2025). Although China has been implementing mandatory physical fitness tests for college students since 2007, the data indicate that the average performance of college students in the 50-meter sprint, standing long jump, sit-ups and 1000-meter run have not shown significant improvement (Dong et al. 2023).

Compared with the nationwide quantitative analysis by Cai et al. (2025), which examined long-term trends in physical fitness and cardiovascular risk factors among Chinese college students using surveillance data from 2000 to 2019, this scoping review provides a complementary synthesis of the broader evidence base. It maps the characteristics, methodologies and determinants of physical fitness reported across existing studies, highlighting variations in measurement approaches, behavioural and contextual factors, and gaps in research coverage. By integrating findings from multiple study designs, this review

offers a comprehensive overview of the current evidence landscape and identifies critical areas requiring further investigation, thereby extending epidemiological insights of Cai et al. (2025) toward more targeted and context-specific research and policy planning. Against the backdrop of the "Healthy China" strategy, it is beneficial to explore the overview of college students' physical activity status and physical education, which is often disregarded and ignored (Wang et al. 2023b).

Specifically, this scoping review had three purposes. The first was to provide an overview of health-related physical fitness status among college students in China. The second was to map out the risk factors for low physical fitness among college students in China. The last was to map the research gaps regarding the health-related physical fitness status of college students in China.

MATERIALS AND METHODS

The framework of this scoping review followed the Arksey and O'Malley's (2005) and Levac et al. (2010) framework, which comprised five stages: identifying the research question, identifying relevant studies, selecting studies to be included, charting the information from the selected studies, and collating, summarising and reporting of results. This scoping review was conducted in strict accordance with the PRISMA-ScR guidelines. The detail about this scoping review protocol has been registered on OSF (https://osf.io/cvm56/).

Stage 1: Identifying Research Question

The review was guided by the following research questions: (i) What is the health-related physical fitness status among college students in China?; (ii) What are the risk factors associated with the low health-related physical fitness status among college students in China?; and (iii) What are the research gaps for health-related physical fitness status of college students in China?

Stage 2: Identifying Relevant Studies

We selected three databases for article searching, PudMed, Scopus and WoS, and searched for the related article published from January 2012 to June 2025. Two independent reviewers (CW and LH) performed the search in parallel using a comprehensive search strategy. The search terms were generated from the Population-Concept-Context (PCC) framework, comprising Population (college student), Concept (physical fitness) and Context (Chinese), keywords and subject headings. Thesaurus and Pubmed MeSH database were used to find out the synonyms of the search terms. The search string used in this step was ("physical fitness" OR "physical activity" OR "motor activity" OR "fitness" OR "workout" OR "active lifestyle" OR "sport" OR "physical training" OR "physical exercise" OR "exercise") AND ("college student" OR "university student" OR "undergraduate") AND ("Chinese" OR "China").

Stage 3: Selecting Studies to be Included

The third stage of the Arksey and O'Malley's (2005) framework was to define the studies to be included in the scoping review. The screening process consisted of two stages: a title and abstract/summary and full-text screening. Eligible studies were identified based on the prespecified inclusion and exclusion criteria: articles published in English with population specifically on Chinese college student in China. The search was limited to English language publications due to the lack of resources for accurate translation and to ensure consistency in data extraction and interpretation. Moreover, most relevant and high-quality studies in this field were published in English indexed databases such as PubMed, Scopus and Web of Science. While this may have excluded some non-English studies, previous evidence suggested that language restriction had minimal impact on the overall conclusions of systematic reviews. (Dobrescu et al. 2021)

We only included peer reviewed publications. Studies which included participants with

psychological or physical illness were excluded. Two researchers (CW, LH) screened the title and abstract and there we both blinded to each other, articles were only included when both researchers agreed and the third independent researcher will be referred to resolve any disagreement between the first two researchers.

Stage 4: Charting the Information from the Selected Studies

We designed a data extraction table and used it to extract findings from the selected studies. Study characteristics which were reported included standard bibliographical information (i.e., authors, title, journal and year of publication), objectives and type of study. We also extracted the following data for each article: study design, study location, participants, physical activity level of Chinese college students and health related physical fitness of Chinese college students. The studies included in this review comprised of three different research designs. For cross-sectional studies, data on health-related physical fitness were directly extracted from the articles. For experimental studies, the relevant data was obtained from the pre-intervention phase. For longitudinal studies, the data were extracted from the final year of follow-up.

Stage 5: Collating, Summarising and Reporting of Results

The results of the data extracted were summarised, analysed and presented using a table of findings, summarising the overall physical fitness status of college students in China.

RESULTS

Literature Search

A total of 3153 articles were retrieved from the three selected databases and 2737 articles remained after removing duplicates. Following the title and abstract screening, 86 articles remained for full text screening. Finally, 34 articles met the inclusion and exclusion criteria. The process of screening and selecting the relevant articles was reported in the PRISMA flow chart (Figure 1).

Characteristics of the Included Studies

Among the 34 included studies, most were of a cross-sectional study design (n = 20) while the remaining studies were either experimental study (n = 7) or longitudinal study (n = 7). The total number of participants reviewed was 486,363 (Range: 6-241,710 participants). One study was exclusively conducted among female and two was exclusively conducted among males. There were 23 studies that explicitly reported participants' ages, which ranged from 15 to 27 years old (Table 1).

Health-related Physical Fitness Assessment Approaches

Referring to Table 1, all articles on body composition used body mass index (BMI) by measuring height and weight (Study No. 1-15, 17, 18 and 24) and six articles used body composition analyser to measure body composition (Study No. 6, 7, 11, 15, 17, 22). Cardiorespiratory fitness involved a total of five measurement methods: 800 m/1000 m run (n = 16) (Study No. 4, 5, 8, 12-15, 18, 20, 23, 24, 26, 27, 29, 33, 34), electronic spirometric tester (n = 19) (Study No. 2, 8, 9, 12-15, 17, 18, 20, 23-28, 30, 33, 34), step test (n = 1) (Study No. 9), cycle-ergometry test (n = 1) (Study No. 7) and intermittent shuttle run test (n = 1) (Study No. 11). Muscular endurance included two measurement methods: sit-up (n = 16) (Study No. 1, 4, 5, 7, 8, 12, 13, 15, 20, 23, 24, 26, 29, 31, 33, 34) and pull-up (n = 17) (Study No. 4, 5, 8, 12-14, 17, 18, 20, 23, 24, 26-28, 31, 33, 34). There were two methods for measuring muscular power: standing long jump (n = 21) (Study No. 3, 4, 5, 7, 8, 9, 12, 15, 18, 20, 23-28, 30, 31, 33, 34), and countermovement jump (n = 1) (Study No. 11). Lastly, one method was for measuring muscular strength: grip strength (n = 4) (Study No. 3, 7, 9, 31). Measuring flexibility was done through sit-and-reach test (n = 21) (Study No. 3-5, 7, 8, 12-15,

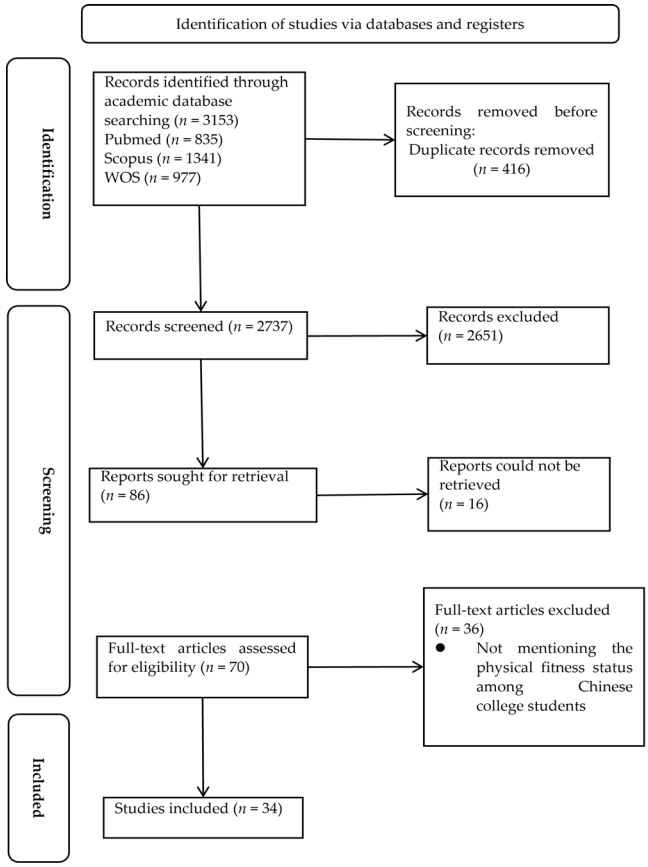

FIGURE 1: PRISMA flow diagram. The PRISMA diagram details the search and selection process applied during our systematic literature search for this scoping review

TABLE 1: Description of studies' characteristics

No	Author (year)	Study design	Location	Sample	Gender	Age
1	Huang et al. (2023)	Cross-sectional study	Taiwan	310	F	20-25
2	Kai (2023)	Cross-sectional study	Wuxi City, Jiangsu Province	1546	M and F	N/R
3	Li et al. (2022)	Cross-sectional study	Huaian City, Jiangsu Province	8977	M and F	N/R
4	Sun et al. (2022)	Cross-sectional study	Nantong City, Jiangsu Province	6425	M and F	15-23
5	Liu et al. (2022)	Cross-sectional study	not mention	64,406	M and F	N/R
6	Maitiniyazi et al. (2021)	Cross-sectional study	Wuxi City, Jiangsu Province	279	M and F	18-27

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No	Author (year)	Study design	Location	Sample	Gender	Age
7	Tian et al. (2020)	Cross-sectional study	Shanghai	249	M and F	N/R
8	Chen et al. (2020)	Cross-sectional study	Anhui province	8548	M and F	15-25
9	Wang (2019)	Cross-sectional study	Beijing	1414	M and F	18-24
10	Qin et al. (2018)	Cross-sectional study	Lanzhou City, Gansu Province	790	M and F	18-27
11	Zhang et al. (2018)	Cross-sectional study	Two universities in China	383	M and F	18-24
12	Wang & Fu (2017)	Cross-sectional study	College students in northern China	6531	M and F	N/R
13	Chun & Yin (2017)	Cross-sectional study	Anhui Province	1800	M and F	N/R
14	Dong et al. (2023)	Longitudinal study	Hebei Province	3185	M	N/R
15	Wang et al. (2023a)	Experimental study	Huzhou City, Zhejiang Province	6	M and F	18-24
16	Zhang et al. (2024)	Longitudinal study	55 minority groups in China	1320	M and F	18-24
17	Lan et al. (2022)	Experimental study	Beijing	50	M and F	18-25
18	Wang et al. (2020)	Experimental study	Shantou City, Guangdong Province	214	M and F	18-20
19	Jie et al. (2023)	Experimental study	Wannan City	6580	M and F	17-22
20	Tang et al. (2024)	Longitudinal study	Sichuan City	634	M and F	20-32
21	Li et al. (2024)	Longitudinal study	Beijing	6156	M and F	18-20
22	Wen et al. (2024)	Experimental study	Shanghai	93	M and F	18-20
23	Wu et al. (2024)	Cross-sectional study	Changchun, Zhengzhou, Urumqi, Chongqing, Shanghai, Guangzhou	30245	M and F	19-22
24	Zhan & Cho (2024)	Cross-sectional study	N/R	742	M and F	18-21
25	Li et al. (2025)	Cross-sectional study	Jinhua City	463	M and F	17-24
26	Cai et al. (2025)	Longitudinal study	30 Cities in China	241710	M and F	19-22
27	Huang et al. (2025)	Experimental study	Sichuan City	26	M	18-22
28	Sun et al. (2025a)	Longitudinal study	Anhui Province	58472	M and F	16-23
29	Sun et al. (2025b)	Experimental study	Beijing	58	M and F	N/R
30	Guo et al. (2024)	Cross-sectional study	Beijing	7541	M and F	N/R
31	Pi et al. (2024)	Cross-sectional study	Henan, Jiangxi and Fujian Province	12046	M and F	19-22
32	Hong et al. (2024)	Cross-sectional study	Changzhou City	7468	M and F	16-24
33	Zhai et al. (2024)	Longitudinal study	Shanghai	5119	M and F	N/R
34	Yan et al. (2024)	Cross-sectional study	Taiyuan City	2577	M and F	N/R

Male: M; Female: F

18-20, 23-28, 30, 33, 34).

Body Composition

(i) Body mass index

According to the studies, four articles mentioned the proportion of college students with normal BMI, ranging from 69.05% to 74.9%. The normal BMI ratio proportion for males ranged from 61.23% to 76.674%, and for females from 74.84% to 87.526%. Twenty-four articles mentioned the average BMI of students, with a range of 20.83 to 22.64 ± 3.83 kg/m^2. The average BMI range for males and females was 20.63 ± 2.96 kg/m^2 to 23.21 ± 3.82 kg/m^2, and 19.63 ± 2.27 kg/m^2 to 21.30 ± 3.22 kg/m^2, respectively. Both males and females were within the normal range of BMI value. Three studies distinguished between normal-weight obesity (NWO) and normal-weight non-obesity (NWNO) based on body mass index. NWO referred to individuals whose BMI fell within the normal range but who had an excessive body fat percentage and relatively low muscle mass. In contrast, NWNO represented a truly healthy "normal-weight" condition, characterised not only by a normal BMI but also by a favourable body composition, including an ideal body fat percentage and sufficient muscle mass. The average BMI range for NWO males was 22.0-23.3, whereas that for NWNO males was 20.6-21.1. For females, the average BMI range was 21.0-21.7 in the NWO group and 19.4-20.3 in the NWNO group.

(ii) Body fat percentage

There were a total of five articles that mentioned body fat percentage (BF%), with three measuring BF% based on NWO and NWNO. The BF% range for NWO and NWNO males was 23.0-23.9% and 12.3% -14.4%, respectively. The BF% range for NWO and NWNO girls was 32.1-34% and 24.4-27.0%, respectively. Males and females with NWO exceeded the standard value of BF%. There were also three articles that measured the average BF% of college students, with values being 26.58 ± 4.66%, 26.02 ± 8.22% and 26.80 ± 6.99%, all of which were above the standard value.

(iii) Skeletal muscle mass

There were four articles mentioning skeletal muscle mass, two of which were distinguished by NWO and NWNO. The skeletal muscle mass of NWO males was lower than the normal range, while the skeletal muscle mass of NWO females, although within the normal range, was almost at the lowest value. The other two articles measured the average skeletal muscle mass of college students: one was 22.05 kg and the other was 25.13 kg. They were all at a relatively low level. Table 2 summarised the findings on body composition from the included studies.

Cardiorespiratory Fitness

Sixteen articles measured the average vital capacity of males and females, with a range of 3539.21 ± 587.69 to 4538 L for males and 2493.58 ± 528.25 to 2996.77 ± 522.03 L for females. One article showed that the rate of substandard vital capacity among college students was 17.1%. Eleven articles measured the average scores of females in the 800 m running test, ranging from 229.4 ± 17.8s to 279.57 ± 45.39s. Two articles measured the failure rate of females in the 800 m running test, which was 8.90% and 4.3%. Thirteen articles measured the average scores of males in the 1000 m running test, ranging from 243.4 ± 21.7s to 292.49 ± 50.42 second. Two articles measured the failure rate of males in the 1000 m running test, which was 20.97% and 18.4%. One article measured the vital capacity and VO_2 max of male and female college students with NWO and NWNO. One article measured the step test scores of male and female college students, with an average score of 54.90 times for males and 54.47 times for females. The results indicated that most students demonstrated cardiorespiratory fitness at a passing level while only a small proportion achieved an excellent level. Many students were slightly above the

TABLE 2: The main findings of body composition among Chinese college students

No	Study	Body composition		
		BMI	**Body fat (%)**	**Skeletal muscle mass (kg)**
1	Huang et al. 2023	BMI: 20.83 kg/m^2	N/R	N/R
2	Kai 2023	Normal BMI F: 87.526% M: 76.674%	N/R	N/R
3	Li et al. 2022	F: 20.4 kg/m^2 M: 22.0 kg/m^2	N/R	N/R
4	Sun et al. 2022	Normal BMI (2020): 70.74% F: 76.18% M: 61.23%	N/R	N/R
5	Maitiniyazi et al. 2021	F: NWO: 21.0 ± 1.6 kg/m^2, NWNO: 20.1 ± 1.2 kg/m^2 M: NWO: 23.3 ± 0.5 kg/m^2, NWNO: 20.6 ± 1.6 kg/m^2	F: NWO: 32.7 ± 2.7%, NWNO: 26.4 ± 2.5% M: NWO: 23.9 ± 3.6%, NWNO: 14.4 ± 2.7%	F: NWO: 20.0 ± 1.96, NWNO: 20.7 ± 2.0 M: NWO: 29.2 ± 2.9, NWNO: 30.5 ± 4.2
6	Tian et al. (2020)	F: NWO: 21.0 ± 1.6 kg/m^2, NWNO: 19.4 ± 1.0 kg/m^2 M: NWO: 22.0 ± 1.4 kg/m^2, NWNO: 20.8 ± 1.5 kg/m^2	F: NWO: 34 ± 3%, NWNO: 27 ± 2% M: NWO: 23 ± 3%, NWNO: 13 ± 3%	N/R
7	Chen et al. (2020)	Normal weight status (2016): 69.05% F: 74.84% M: 61.47%	N/R	N/R
8	Wang (2019)	F: 20.85 ± 2.36 kg/m^2 M: 22.21 ± 2.71 kg/m^2	N/R	N/R
9	Qin et al. (2018)	BMI: 21 ± 3 kg/m^2 F: 20 ± 2 kg/m^2 M: 22 ± 3 kg/m^2 Normal BMI: 71.0%	N/R	N/R
10	Zhang et al. (2018)	F: NWO: 21.7 ± 1.3 kg/m^2, NWNO: 20.3 ± 1.3 kg/m^2 M: NWO: 22.5 ± 1.2 kg/m^2, NWNO: 21.1 ± 1.4 kg/m^2	F: NWO: 32.1 ± 2.3%, NWNO: 24.4 ± 2.6% M: NWO: 23.1 ± 3.4%, NWNO: 12.3 ± 3.8%	F: NWO: 20.2 ± 0.05, NWNO: 22.0 ± 0.07 M: NWO: 28.3 ± 0.1, NWNO: 32.2 ± 0.1
11	Wang & Fu (2017)	F: 20.77 kg/m^2 M: 22.13 kg/m^2	N/R	N/R
12	Chun & Yin (2017)	Normal BMI: 71.4%	N/R	N/R
13	Dong et al. (2023)	2013-2019 mean: 21.06 kg/m^2	N/R	N/R
14	Wang et al. (2023b)	BMI: 21 ± 2.61 kg/m^2	BF (%): 26.58 ± 4.66%	SMM: 22.05 ± 2.81
15	Zhang et al. (2024)	BMI: 21.7 kg/m^2 Normal weight: 74.9%		
16	Lan et al. (2022)	BMI: 21.33 ± 2.93 kg/m^2	BF (%): 26.02 ± 8.22%	SMM: 24.17 ± 4.30
17	Wang et al. (2020)	F: 19.63 ± 2.27 kg/m^2 M: 20.63 ± 2.96 kg/m^2	N/R	N/R
18	Tang et al. (2024)	BMI: 21.24 ± 3.06	N/R	N/R

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No	Study	Body composition		
		BMI	Body fat (%)	Skeletal muscle mass (kg)
19	Li et al. (2024)	BMI: 22.64 ± 3.83	N/R	N/R
20	Wen et al. (2024)	BMI: 21.34 ± 3.32	BF: 26.80 ± 6.99%	N/R
21	Wu et al. (2024)	F: 19.63 ± 2.34 M: 22.19 ± 2.88	N/R	N/R
22	Zhan & Cho (2024)	F: 20.85 ± 2.61 M: 22.43 ± 3.35	N/R	N/R
23	Li et al. (2025)	F: 20.90 ± 2.87 M: 21.20 ± 4.05	N/R	N/R
24	Cai et al. (2025)	BMI: 20.96	N/R	N/R
25	Huang et al. (2025)	M: 23.2 ± 4.2	N/R	N/R
26	Sun et al. (2025b)	BMI: 22.33 ± 2.87	N/R	N/R
27	Guo et al. (2024)	F: 21.30 ± 3.22 M: 22.74 ± 4.07	N/R	N/R
28	Pi et al. (2024)	F: 21.23 ± 2.85 M: 22.99 ± 3.41	N/R	N/R
29	Hong et al. (2024)	BMI: 22.3 ± 3.9	N/R	N/R
30	Zhai et al. (2023)	F: 20.4 ± 2.2 M: 22.3 ± 3	N/R	N/R
31	Yan et al. (2024)	F: 21.23 ± 2.83 M: 23.21 ± 3.82	N/R	N/R

Male: M; Female: F; BMI: Body mass index; BF: Body fat; NWO: Normal weight obesity; NWNO: Normal weight non-obesity; N/R: Not reported; SMM: Skeletal muscle mass

passing threshold, showing a considerable gap from the excellent standard. In addition, a certain proportion of students remained at a failing level. Cardiorespiratory fitness findings were presented in Table 3.

Muscular Fitness

Eighteen articles reported muscular power as measured by the average scores of standing long jump test, with an average range of 215.02 ± 24.55 to 236.6 ± 18.5 cm for males and 161.88 ± 18.01 to 184.1 ± 15.8 cm for females. Two articles measured the failure rates of male and female college students in standing long jump, with 10.42% and 13.3% and 6.09% and 8.3%, respectively. One article measured the average scores of NWO and NWNO male and female students in standing long jump. Regarding the muscular power level of college students, the average performance of male students only reached the passing threshold, whereas that of female students was at a good level. Notably, nearly 20% of students failed to meet the passing standard.

Three articles reported muscular strength as measured by the average grip strength, with 39.7 to 48.70 ± 8.91 kg for males and 22.8 to 30.89 ± 6.12 kg for females. One article measured the average scores of NWO and NWNO male and female students in grip strength. With respect to muscular strength, the overall grip test results

TABLE 3: The main findings of cardiorespiratory fitness among Chinese college students

No	Study	Cardiorespiratory Endurance				
		Vital capacity (ml)	VO_2 max (mL/kg/min)	800 m (s/%)	1000 m (s/%)	Steptest (Times)
1	Sun et al. (2022)	F: 2761.92 ± 514.88 M: 3949.3 ± 755.9	-	F: 242.18 ± 20.33	M: 251.7 ± 26.2	-
2	Liu et al. (2022)	F: NWO: 2413 ± 558, NWNO: 2314 ± 516 M: NWO: 3222 ± 927, NWNO: 3187 ± 833	-	F: 8.90% (Fail)	M: 20.97% (Fail)	-
3	Tian et al. (2020)	F: 2996.77 ± 522.03 M: 4448.21 ± 767.66	F: NWO: 31 ± 4 NWNO: 33 ± 6 M:NWO: 37 ± 8 NWNO: 41 ± 6	-	-	-
4	Wang (2019)	F: 2655 M: 4070	-	-	-	F: 54.90 ± 9.29 M: 54.47 ± 7.81
5	Wang & Fu (2017)	F: 2655 M: 4070	-	F: 267.92	M: 273.96	-
6	Chun & Yin (2017)	Fail: 17.1%	-	F (Fail): 4.3%	M (Fail): 18.4%	-
7	Dong et al. (2023)	2013-2019 mean: 4079.60	-	-	2013-2019 mean: 252.00	-
8	Wang et al. (2020)	F: 2493.58 ± 528.25 M: 3769.17 ± 780.84	-	F: 256.84 ± 30.89	M: 268.03 ± 37.43	-
9	Jie et al. (2023)	F: 3087 M: 4538	-	F: 232	M: 245	-
10	Tang et al. (2024)	3212.66 ± 831.33	-	F: 268.8 ± 51	M: 277.2 ± 52.2	-
11	Wu et al. (2024)	F: 2843.03 ± 547.32 M: 4175.51 ± 727.08	-	F: 279.57 ± 45.39	M: 292.49 ± 50.42	-
12	Zhan & Cho (2024)	F: 2629.41 ± 41.11 M: 3539.21 ± 587.69	-	F: 234.25 ± 21.47	M: 249.46 ± 27.68	-
13	Li et al. (2025)	F: 2739 ± 706.50 M: 4303 ± 1063.00	-	-	-	-

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No	Study	Cardiorespiratory Endurance				
		Vital capacity (ml)	VO_2 max (mL/kg/min)	800 m (s/%)	1000 m (s/%)	Steptest (Times)
14	Cai et al. (2025)	3265	N/R	F: 262.30	M: 270.70	N/R
15	Huang et al. (2025)	M: 4476.7 ± 758.7	N/R	N/R	M: 276 ± 36	N/R
16	Sun et al. (2025a)	F: 2510.0 ± 458.0 M: 3702.7 ± 741.3	N/R	F: 258 ± 30	M: 264 ± 42	N/R
17	Guo et al. (2024)	F: 2883.96 ± 475.13 M: 4200.36 ± 667.85	N/R	N/R	N/R	N/R
18	Zhai et al. (2023)	F: 2622.4 ± 508.2 M: 3785.8 ± 716.1	N/R	F: 229.4 ± 17.8	M: 243.4 ± 21.7	N/R
19	Yan et al. (2024)	F: 2761.89 ± 542.50 M: 4161.35 ± 802.46	N/R	F: 259.63 ± 37.74	M: 278.76 ± 52.88	N/R

Male: M; Female: F; m: meter;NWO: Normal weight obesity; NWNO: Normal weight non-obesity; N/R: Not reported; s: second; VO_2 max: Maximal oxygen uptake

were favourable, with average scores above the passing threshold. Many students achieved ratings of good or excellent.

Seventeen articles reported muscular endurance. Fourteen articles measured the average score of male pull-ups, ranging from 3 - 9.89 times. Fifteen articles measured the average score in sit-ups, which were all for females except one article, ranging from 29.03 ± 8.82 to 41.2 ± 8.2 times/min. Two articles measured the failure rates of male pull-up and female sit-up, with 81.21% and 45.6% for males and 15.69% and 20.8% for females. One article measured the average sit-up performance of NWO and NWNO males and females. The data indicated that most male students exhibited relatively poor levels of muscular endurance whereas female students generally demonstrated superior muscular endurance compared to their male counterparts.

Flexibility

Fourteen articles measured the average performance of male and female college students in sit-and-reach test, with a range of 8.44 ± 7.74 to 16.7 ± 10.70 cm for males and 13.75 ± 7.03 to 20.10 ± 11.10 cm for females. Two articles reported the failure rates of male and female college students in sit-and-reach test, with 4.77% and 7.3% for males and 2.17% and 5.1% for females. One article measured the average sit-and-reach performance of NWO and NWNO male and female college students. The data revealed that both male and female college students demonstrated relatively good levels of flexibility, with female students outperforming their male counterparts. Moreover, only a very small proportion of students fell below the passing standard. Table 4 summarised the findings for muscular fitness and flexibility components of health-related physical fitness.

The Factors Influencing Low Physical Fitness among Chinese College Students

Table 5 showed the factors influencing of low physical fitness among Chinese college students. Among the 34 included studies, there were eight factors mentioned that led to the low physical fitness among Chinese college students: lack of

TABLE 4: The main findings of muscular fitness and flexibility among Chinese college students

No	Study	Cardiorespiratory Endurance				Flexibility
		Muscular power	Muscular strength	Muscular endurance		
		Standing long jump (cm)	Grip strength (kg)	Sit-up (Times/ min)	Pull-up (Times)	Sit-and-reach (cm)
1	Li et al. (2022)	F: 171.1 cm M: 229.9 cm	F: 22.8 kg M: 39.7 kg			F: 16.7 cm M: 11.3 cm
2	Sun et al. (2022)	F: 169.05 cm M: 227.5 cm	-	F: 37.51 ± 8.86	M: 7.7 ± 5.5	F: 18.98 cm M: 13.8 cm
3	Liu et al. (2022)	F: 6.09% (Fail) M: 10.42% (Fail)	-	F: 15.69% (Fail)	M: 81.21% (Fail)	F: 2.17% (Fail) M: 4.77% (Fail)
4	Tian et al. (2020)	F: NWO: 162 ± 16, NWNO: 174 ± 18 M: NWO: 217 ± 16, NWNO: 235 ± 9	F: NWO: 23.4 ± 3.9, NWNO: 24.4 ± 4.2 M: NWO: 37.6 ± 3.2, NWNO: 38.9 ± 5.5	-	-	F: NWO: 14.9 ± 6.9, NWNO: 16.0 ± 6.4 M: NWO: 11.3 ± 5.8, NWNO: 14.7 ± 6.9
5	Wang (2019)	F: 167 ± 17 M: 223 ± 18	F: 30.89 ± 6.12 M: 48.70 ± 8.91	-	-	-
6	Wang & Fu (2017)	F: 161.89 M: 222.09	-	F: 32	M: 5	-
7	Chun & Yin (2017)	F: 8.3% (Fail) M: 13.3% (Fail)	-	F (Fail): 20.8%	M (Fail): 45.6%	F: 5.1% (Fail) M: 7.3% (Fail)
8	Dong et al. (2023)	2013-2019 mean: 224.89	-	-	2013-2019 mean: 9.89	2013-2019 mean: 11.85
9	Wang et al. (2020)	F: 163 ± 18 M: 223 ± 23	-	F: 33.41 ± 8.70	M: 3.77 ± 3.63	F: 13.75 ± 7.03 M: 8.44 ± 7.74
10	Chang et al. (2023)	F: 177 M: 233	-	F: 37	M: 5	F: 20.6 M: 16.7
11	Tang et al. (2024)	182.59 ± 32.25	-	F: 29.03 ± 8.82	M: 4.75 ± 5.12	14.75 ± 6.65
12	Wu et al. (2024)	F: 165.60 ± 21.02 M: 221.68 ± 21.26	-	-	-	-
13	Zhan & Cho (2024)	F: 171.06 ± 15.58 M: 219.71 ± 23.06	-	-	-	-
14	Li et al. (2025)	F: 171.00 ± 22.50 M: 226.00 ± 32.00	-	-	-	-
15	Cai et al. (2025)	187	-	F: 31.00	M: 3.00	13.6
16	Huang et al. (2025)	M: 226.2 ± 21.9	-	-	M: 5.4 ± 6.1	M: 12.9 ± 6.8

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No	Study	Cardiorespiratory Endurance				Flexibility
		Muscular power	Muscular strength	Muscular endurance		
		Standing long jump (cm)	Grip strength (kg)	Sit-up (Times/min)	Pull-up (Times)	Sit-and-reach (cm)
17	Sun et al. (2025a)	F: 167.4 ± 18.4 M: 224.1 ± 24.9	-	F: 32.0 ± 7.7	M: 7.8 ± 5.6	F: 17.0 ± 5.8 M: 14.1 ± 6.8
18	Guo et al. (2024)	F: 162.40 ± 17.18 M: 216.80 ± 20.47	-	-	-	F: 18.94 ± 5.96 M: 15.78 ± 6.89
19	Pi et al. (2024)	F: 173.12 ± 14.32 M: 233.17 ± 18.63	F: 28.72 ± 6.32 M: 45.09 ± 9.08	F: 37.20 ± 4.87	M: 12.03 ± 4.87	-
20	Zhai et al. (2023)	F: 184.1 ± 15.8 M: 236.6 ± 18.5	-	F: 41.2 ± 8.2	M: 3(1-7)	F: 18.8 ± 5.7 M: 13.3 ± 6.2
21	Yan et al. (2024)	F: 161.88 ± 18.01 M: 215.02 ± 24.55	-	F: 33.67 ± 7.20	M: 5.36 ± 5.51	F: 17.19 ± 6.87 M: 12.22 ± 8.60

Male: M; Female: F; NWO: Normal weight obesity; NWNO: Normal weight non-obesity

exercise (*n* = 8) (Guo et al. 2024; Huang et al. 2023; Kai 2023; Maitiniyazi et al. 2021; Qin et al. 2018; Tang et al. 2024; Wang 2019; Wu et al. 2024), spending too much time on computer and smartphone (*n* = 4) (Cai et al. 2025; Kai 2023; Qin et al. 2018; Wu et al. 2024), bad dietary habits (*n* = 7) (Cai et al. 2025; Guo et al. 2024; Maitiniyazi et al. 2021; Pi et al. 2024; Qin et al. 2018; Tang et al. 2024; Wu et al. 2024), mental disturbance (*n* = 3) (Hong et al. 2024; Huang et al. 2023; Maitiniyazi et al. 2021), lack of awareness of physical exercise (*n* = 1) (Kai 2023), sleeping deprivation (*n* = 3) (Cai et al. 2025; Qin et al. 2018; Wu et al. 2024), shortcomings in school physical education (*n* = 2) (Cai et al. 2025; Kahl & Malfertheiner 2004) and home isolation during COVID-19 (*n* = 5) (Guo et al. 2024; Jie et al. 2023; Li et al. 2024; Sun et al. 2025a; Zhai et al. 2023). The main reason for the low physical fitness of Chinese college students was the lack of exercise.

DISCUSSION

This scoping review overviewed the studies on health-related physical fitness status among Chinese college students and identified the reported factors that caused the resulting physical fitness. Based on the 34 included studies, only a few test items had a high pass rate, and a few items had a low pass rate, prompting the urgent needs to improve the physical fitness level of Chinese college students. The period of college students is the most prosperous and vigorous time in life. However, the analysis of the physical fitness of Chinese college students showed declining vital capacity, muscular strength, muscular endurance and flexibility throughout the university stage, highlighting a substantial problem (Zhang & Jiang 2023). Therefore, an effective action plan is needed to overcome this situation.

The improved living standards and nutritional status have enhanced the body shape and physical fitness of Chinese college students to varying degrees, but excessive nutrition is an important reason for student obesity (Qian et al. 2023). Based on national survey data from 2000 to 2019 on Chinese college students (aged 19-22), the prevalence of overweight or obesity increased sharply from 3.7% to 14.0%. Meanwhile, the prevalence of elevated blood pressure rose from

TABLE 5: The factors influence low physical fitness among Chinese college students

No	Study	Spending too much time on computer and smartphone use	Bad dietary habits	Lack of exercise	Mental disturbance	Lack of awareness of physical exercise	Sleep deprivation	Shortcomings in school physical education	Home isolation during COVID-19
1	Huang et al. (2023)	-	-	√	√	-	-	-	-
2	Kai (2023)	-	-	√	-	√	-	-	-
3	Li et al. (2022)		-	-	-	-	-	-	-
4	Maitiniyazi et al. (2021)	-	√	√	√	-	-	-	-
5	Wang (2019)	-	-	√	-	-	-	-	-
6	Qin et al. (2018)	√	√	√	-	-	√	-	-
7	Chun & Yin (2017)	-	-	-	-	-	-	√	-
8	Jie et al. (2023)	-	-	-	-	-	-	-	√
9	Tang et al. (2024)	-	√	√	-	-	-	-	-
10	Li et al. (2024)	-	-	-	-	-	-	-	√
11	Wu et al. (2024)	√	√	√	-	-	√	-	-
12	Cai et al. (2025)	√	√	-	-	-	√	√	-
13	Sun et al. (2025b)	-	-	-	-	-	-	-	√
14	Guo et al. (2024)	-	√	√	-	-	-	-	√
15	Pi et al. (2024)	-	√	-	-	-	-	-	-
16	Hong et al. (2024)	-	-	-	√	-	-	-	-
17	Zhai et al. (2023)	-	-	-	-	-	-	-	√

2.2% to 5.2%, and the rate of co-occurrence of overweight or obesity with high blood pressure also increased from 0.3% to 1.8% (Cai et al. 2025). The decrease in exercise is an important reason for the decline in physical fitness among college students (Wang 2019). Overweight and obesity lead to a variety of diseases, such as diabetes, hyperlipidaemia, and other metabolic-related chronic diseases (Chooi et al. 2019). Therefore, controlling the overweight and obesity of college students is an important aspect in the field of modern preventive medicine. If measures are not taken in a timely manner, it will seriously affect the physical health of the Chinese population (Wang et al. 2021). On the other end of BMI spectrum, having a low BMI and being underweight are also problematic (Cuntz et al. 2023). At least 17% body fat is a necessary condition for the onset of menarche, and 22% body fat is a necessary condition for maintaining ovulatory menstruation (Nguyen et al. 2020).

According to BMI values, females are divided into three groups: normal group, frail group and obese group. The results showed that the probability of frequent dysmenorrhea in the frail group was 1.3 times higher than the other two groups (Attia et al. 2023). Therefore, while we focus on controlling the overweight and obesity rates of college students, we should also strengthen the health education related to being thin and underweight as well as the aesthetic awareness induction of female college students, which is also an important topic for future epidemiological research. It should be noted that some included studies employed the terms NWO and NWNO to classify participants. These designations were retained in our synthesis to ensure fidelity to the original literature. However, these terms are not yet consistently defined across the field, and caution should be taken when interpreting findings, as variations in terminology and classification criteria may influence comparability across studies.

Body weight can be categorised into three groups: underweight, normal weight and overweight/obese (Zhang et al. 2018). The differences in physical fitness among the three groups are significant, with the larger the weight of college students, the higher their vital capacity (Chen et al. 2020). Even though lung volume or capacity, which is measured by spirometer, is not a direct measurement for cardiorespiratory fitness, it somehow indirectly explains it (Liu et al. 2025). Statistical analysis of the total physical fitness scores across gender and grade groups, as well as among male and female students stratified by vital capacity levels, demonstrated significant between-group differences ($p < 0.05$). Students with higher lung capacity consistently achieved greater mean total physical fitness scores compared with those with lower lung capacity. These findings indicate a positive association between vital capacity and overall physical fitness status in college students (Kai 2023). The vital capacity and endurance running performance of overweight and obese college students were markedly lower than those of the normal group, indicating that overweight and obesity significantly and negatively impacted the cardiovascular function of college students. Overweight and obesity are associated with adverse health effects, posing risks to the cardiovascular and respiratory systems of college students (Watso et al. 2023). In addition, the vital capacity and endurance running performance of male and female college students have shown a downward trend, indicating that the cardiovascular function of college students has been declining year by year (Tian et al. 2020). The decrease in vital capacity reflects the serious deficiencies in cardiovascular and even physical fitness among Chinese college students. In the future, more aerobic exercise and endurance running should be conducted as physical activities (Liu et al. 2023; Shu et al. 2023; Wang et al. 2023a).

The muscular strength level of Chinese college students is generally low, mostly due to a lack of systematic strength training and unhealthy lifestyles, such as prolonged sitting and excessive use of electronic devices, which can lead to a decrease in muscular strength (Li et al. 2022). The muscular endurance level of Chinese college students is also relatively low,

which is associated with a lack of regular aerobic exercise or long-term strength training (Sun et al. 2022). Inadequate nutrient intake and unhealthy dietary habits compromise the body's energy supply and adversely affect muscular endurance. Among Chinese college students, flexibility levels are generally higher compared with muscular strength and endurance; nevertheless, a minority of students still fell short of the established standards (Li et al. 2022).

College students have high requirements for self-control in the relaxed campus study life. Some college students hope to have a relaxed college life after a highly intense high school life. Abnormal sleep patterns, unhealthy dietary habits, and unscientific learning and entertainment methods are all important factors that affect physical fitness (Hao et al. 2023). Regarding the issue of student lifestyle, it is necessary not only to strengthen the monitoring of their daily routine during their time in school, but also to educate them on healthy lifestyles as much as possible so that students can have subjective initiative in managing their own health, strengthen the evaluation of their own health by the school and students, establish health records, establish new assessment and evaluation mechanisms, and link them with student rewards and evaluations to motivate students to strengthen their health management (Maitiniyazi et al. 2021).

Universities generally offer physical education classes in their freshman and sophomore years while there is no arrangement for physical education classes in their junior and senior years (Kahl & Malfertheiner 2004). As a result, students without exercise habits will not actively engage in exercise. This is also one of the main reasons why college students experience a negative increase in their physical fitness test scores as they age. On the other hand, when students choose their own physical education classes, they are often unwilling to choose physical education classes with high physical activity levels, and generally prioritise lighter physical education classes. In addition, college physical education classes lack mandatory requirements for exercise intensity and quantity, and teachers give students more opportunities to exercise independently. As a result, physical education classes for college students lack the necessary amount and intensity of exercise and cannot achieve the expected exercise results. This is also the main reason why there is a decline in cardiovascular fitness, muscular endurance, and muscular strength among students (Lan et al. 2022). In response to the shortage of physical education classes and physical activity among students, schools should optimise curriculum design and provide incentive mechanisms for clubs, sports festivals and various sports competitions. Only when students are willing to actively participate in various sports activities and form internal motivation for sports, can they actively engage in sustainable and moderate exercise (Liu et al. 2023). On this basis, schools need to provide professional guidance on sports events, physical fitness, and nutrition, as well as support for venues and equipment.

A large proportion of college students express that they do not have the habit of participating in exercise. The development of student sports habits is related to their mastery of sports skills, whether it is skill-based sports (such as basketball, fencing) or physical fitness projects (such as long-distance running, swimming). Only by mastering the basic skills of sports can they continue to participate in a specific sports process. However, the formation of sports skills not only is dependent on learning in physical education classes, but also requires a combination of physical education classes, extracurricular exercises and fitness clubs to practice together with classmates in sports. Presently, the exercise effect is better. Therefore, for a long period of time in the future, strengthening students' awareness of physical exercise, enhancing their sports skills, providing a good sports environment and promoting them to develop conscious exercise habits will be the focus of work.

There are currently some gaps in research on the health-related physical fitness of Chinese college students. At present, the methods have limitations and lack more specific, professional, and representative evaluation methods. Moreover, the existing research data, especially

the national survey report on the physical fitness and health of Chinese college students, often has a certain lag, unable to keep up with the latest developments and trends in the physical fitness and health in a timely manner. Current research focuses more on the body shape, physical fitness, and physical function of Chinese college students, but lacks in-depth analysis of specific influencing factors. For example, research on the issues of overweight and obesity among Chinese college students, as well as the decline in physical fitness levels, has not delved deeply into the underlying reasons behind these phenomena.

While this scoping review offers valuable insights, several limitations must be acknowledged. First, despite efforts to conduct a comprehensive search across major international databases, potentially relevant studies published in regional Chinese journals or grey literature may have been missed. Such omissions could have limited the cultural breadth of perspectives and the inclusion of context-specific findings. Second, the included studies were highly heterogeneous in terms of research design, participant characteristics and fitness assessment methods. This diversity makes it difficult to draw direct comparisons or identify consistent patterns, particularly when examining subgroups such as younger versus older students. Third, much of the available evidence relied on cross-sectional surveys rather than longitudinal designs. This reliance on one-time assessments limits the ability to capture temporal changes and long-term trends in student fitness, thereby restricting understanding of how these patterns evolve over time.

Publication bias is another concern, as studies reporting non-significant or weaker findings may have been less likely to be published or indexed, potentially skewing the overall evidence base. Moreover, most studies adopted a narrow biomedical focus on physical fitness measures, with relatively few addressing broader determinants such as psychological well-being, social environments, or institutional policies that may shape fitness behaviors among students. A more integrative approach incorporating these dimensions would likely have provided a richer and more holistic understanding of the challenges and facilitators influencing student fitness. Taken together, these limitations highlight the need for future research to broaden its scope, adopt more robust and longitudinal designs, and situate fitness within a wider biopsychosocial and policy framework.

CONCLUSION

This scoping review presents the reported physical fitness status of Chinese college students from existing studies. The results showed that Chinese college students generally had weak physical fitness, with a certain proportion of students failing in muscular strength test, muscular endurance test, cardiorespiratory fitness test and flexibility test. The obesity rate among Chinese college students is on the rise although some students are underweight. Despite not being as prominent as obesity, underweight still needs to be taken seriously. The excessive use of electronic devices, unhealthy lifestyle habits, mental health issues, lack of awareness regarding physical activity and deficiencies in school-based physical education all exert varying degrees of negative influence on the physical fitness of Chinese college students. Current research on health-related physical fitness among Chinese college students remains limited. Future studies should improve methodological rigor, data timeliness, and research depth to provide more robust scientific evidence for policy development and practical interventions.

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