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When Physical Education Becomes High-Stakes: Using Baidu Index to Track Public Online Attention to China's Zhongkao PE

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Abstract

Background: In 2020, China issued several national policy documents that emphasized reforming school physical education (PE) and gradually increasing its score weight in the *Zhongkao* (China's High School Entrance Examination). This policy shift brought PE into closer connection with high-stakes educational assessment and appears to have generated growing public attention and information-seeking.

Objective: This study explores temporal patterns, geographic and demographic distributions in public online search behavior related to *Zhongkao* PE, following the 2020 national policy of PE assessment.

Methods: The Baidu Index platform was used to collect search data for the Chinese keyword "体育中考" (*Zhongkao PE*) from May 1, 2019, to May 1, 2026. Descriptive analyses were conducted to examine weekly search trends, PC and mobile search patterns, geographic search distribution, and demographic profiles by age and gender.

Results: The study results show clear seasonal fluctuations around examination periods and a noticeable increase after 2021. Geographically, search activity was concentrated in coastal and highly urbanized regions. Demographically, users aged 30–49 years accounted for the largest share of searches, followed by users aged ≤19 years. Female users demonstrated more searches than males, although male users showed higher relative concentration.

Conclusion: The *Zhongkao PE* reform was not only an assessment change but also a public information event. Given that high-stakes PE testing can raise public attention to physical education, policymakers should provide clear, health-oriented guidance to keep the reform focused on its original goal for improving student health and promoting physical activity for the long term.

Key words: *Zhongkao* PE; high-stakes assessment; Baidu Index; public attention

1. Introduction

Over the recent decades, adolescent physical fitness has become a growing public health concern worldwide (Kaster et al., 2020; Tomkinson et al., 2021). In China, national surveillance data also indicate cardiorespiratory fitness among adolescents declined substantially from 1985 to 2019 (Ruan & Tang, 2024). In response, a key policy announced in October 2020 turned point, when the General Offices of the Communist Party of China Central Committee and the State Council issued a national guideline, requiring physical education to be included in the scope of academic examinations secondary school. Besides, the new policy called for gradually increasing the score weight of PE in *Zhongkao* and improving the content and method of testing (Xinhua News Agency, 2020).

Responding to the call, several provinces and cities shortly adjusted their *Zhongkao* PE assessment structure. In late October 2020, Yunnan Province became the first province that raised the *Zhongkao* PE score weight from 50 to 100 points, giving PE equal importance as the three core academic subjects (Chinese, Mathematics, and English). Guangzhou followed in November 2020, increasing PE scores from 60 to 70 points (China Daily, 2020). Beijing's December 2021 reform further extended PE assessment into earlier school years, mandating the test results from grades 4, 6, and 8 to be incorporated into the *Zhongkao* score calculation (Beijing Municipal Education Commission, 2021). A comparative analysis of PE examination schemes in 19 provincial and cities also reported that 14 cities had adopted a combined formative and summative evaluation method, as a mainstream approach of *Zhongkao* PE assessment (Zhang et al., 2023).

The policy shift may also have influenced family sports-related consumption. A report on the *2021 Mass Fitness Behavior and Consumption Research* noted that 67% of respondents had heard of the PE–*Zhongkao* integration policy; among parents, 67% believed that the policy would influence their spending on children's sports training, and 76% considered PE-exam-oriented training classes necessary (Zhang, 2021). The same report also indicated that the proportion of exam-oriented PE training increased, and that preparation for entrance examinations was the leading motivation for children's sports training.

Despite this intense public discourse, little is known about how public online attention to *Zhongkao* PE changed over time. Previous studies have largely relied on small-scale surveys and qualitative interviews (e.g., Yang et al., 2025; Yin et al., 2025; Zhang et al., 2024), yet their limited sample sizes and geographic scope fail to capture national-wide patterns over time and

across regions. Therefore, the present study addresses these gaps by analyzing Baidu Index[1] search data, through online information-seeking patterns, to quantify public attention to the *Zhongkao* PE examination before and after the 2020 reform. Specifically, the following three research questions are formulated:

RQ1: Did the 2020 policy announcement lead to an increase in search volume?

RQ2: Did geographic regions and demographic groups (age, gender) show disparity in search activity?

RQ3: What do these patterns reveal about public attention and information-seeking around high-stakes PE assessment?

By examining these questions, this study offers empirical insights for physical education policy, meanwhile attempting to discuss the unintended outcomes that may arise when high-stakes testing is extended to non-academic subjects like PE.

2. Research materials and methods

To examine public attention to the *Zhongkao* PE, data were obtained from the Baidu Index platform, a publicly accessible big-data platform operated by Baidu Inc (https://www.baidu.com). Baidu is a major Chinese-language search engine in mainland China, and since Google search services dropped out of mainland China in 2010, Baidu Index has been widely used to examine online information-seeking behavior in Chinese contexts. The platform provides standardized search index values for selected keywords, including temporal trends and user-profile information (Tan et al., 2024). Each online query provides demand mapping and a demographic and geographic distribution map.

The Chinese keyword “体育中考” (equivalent to “*Zhongkao* PE in English”) was applied as the search term. Before finalizing the search strategy, several related Chinese keywords were screened, including more specific terms related to *Zhongkao PE*, e.g. *PE training*, *PE examination*, and *PE preparation strategies*. However, these specific keywords were either not indexed or not able to provide continuous usable data in the Baidu Index platform, most likely due to insufficient search volume. Therefore, the keyword *Zhongkao PE* was selected as the primary search term as it directly matched the focus of this study, and the extracted data were stable and showed clear temporal variation across the full study period.

[1] Baidu Index (https://index.baidu.com) is the largest Chinese search trend analysis tool, colloquially known as the Chinese version of "Google Trends."

To assess whether this single-keyword approach omitted substantial related searches, we conducted a keyword validation using "体育培训" (PE training), the most directly related term for which continuous data were available. As shown in Supplementary Figure S1, the two time series exhibited highly similar temporal patterns, with "PE training" search volume consistently lower than that of "*Zhongkao* PE". This suggests that even if related searches were omitted, the volume of omitted searches would be small and would not alter our core findings.

The search period covered May 1, 2019, to May 1, 2026. This seven-year window included approximately 17 months before the October 2020 national policy announcement and more than five years afterward, allowing temporal changes in public search attention before and after the reform period to be observed. Three levels of descriptive analysis were conducted after the data were extracted. First, weekly search index values were plotted to describe temporal patterns and device-specific (PC vs. mobile) differences during the studied period. Second, provincial and city rankings were examined to explore the geographic concentration of search activity. Third, demographic distributions were analyzed by age group and gender, and each group's search activity was interpreted together with the Target Group Index values (TGI)[2].

All data used in this study were aggregated, anonymized, and publicly accessible through the Baidu Index platform. The study did not involve individual-level data, personal identifiers, or direct interaction with human participants. Therefore, institutional ethics approval was not required.

3. Results

3.1. Temporal trends in Baidu search index

Figure 1 shows the weekly Baidu Index values for the keyword "体育中考" from May 2019 to May 2026. The overall search index in Figure 1A displayed that peaks appeared repeatedly around the Zhongkao examination period, especially in May and June. Before the 2020 national policy reform, the search index fluctuated at a relatively moderate level, with seasonal peaks generally around 500–600. During 2020, likewise, the search index remained relatively low and did not show an immediate increase after the national policy announcement. The first marked post-policy increase appeared during the 2021 examination season (May-June), when the overall search index reached approximately 1,100 in June 2021. This represented an

[2] All values presented in this study were directly obtained from the Baidu Index platform, including the weekly search index values for the overall search trend, the PC search index, the mobile search index, and the TGI values for interpreting the relative concentration of a target group among searchers compared with its baseline proportion among all Baidu users.

increase of about 80% compared with the pre-policy seasonal peak of approximately 600 observed in September 2019. In subsequent years, examination-season peaks continued to remain at a high level, over 1000 except in 2023 being slightly lower.

A comparison of the personal computer (PC) search index (Figure 1B) and the mobile wireless search index (Figure 1C) reveal a certain divergence in search device preferences over time. The mobile search index closely mirrors the overall search trend in both magnitude and temporal pattern, whereas PC search index shows a gradual but consistent decline throughout the study period.



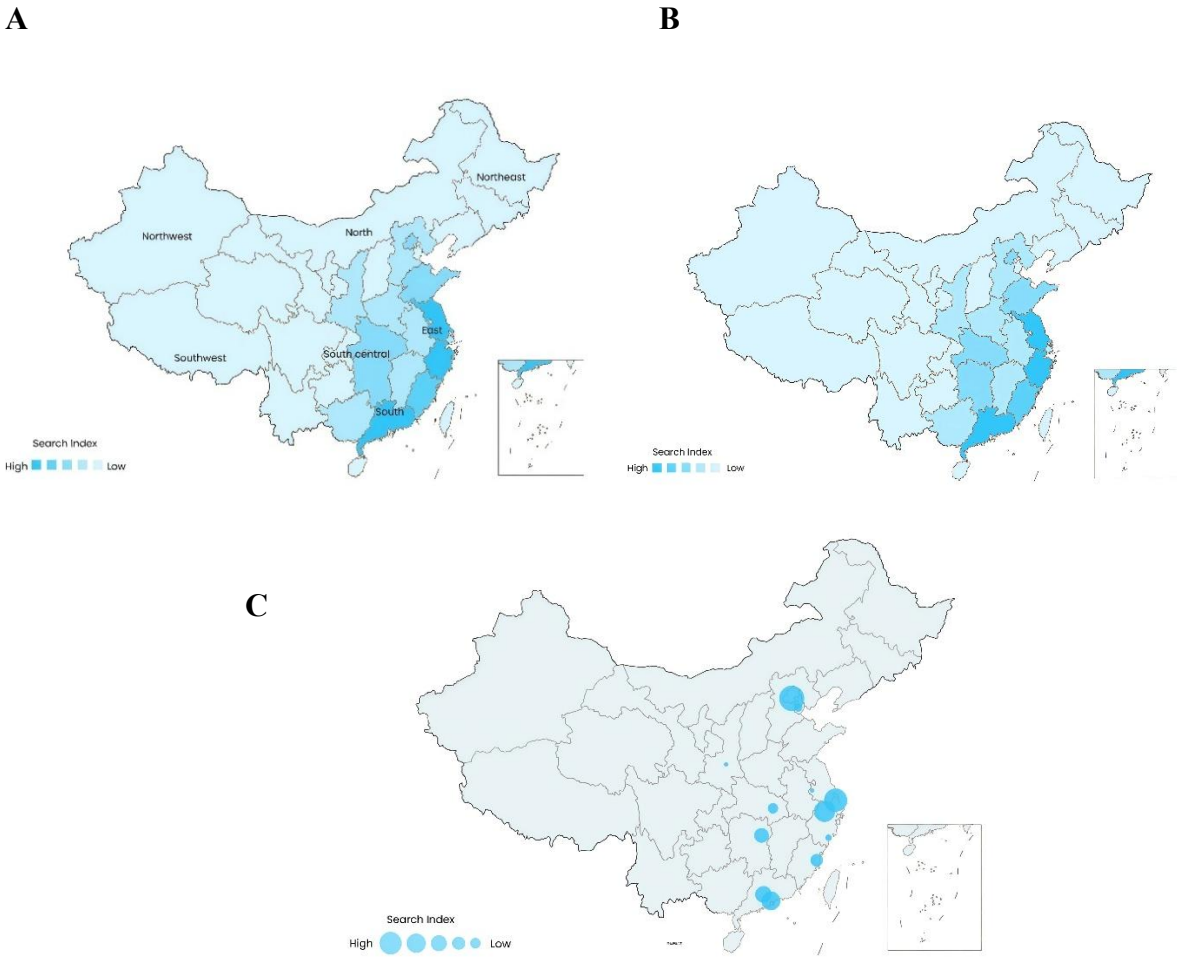
Source: Baidu index

Figure 1. Baidu search volume index in China during 2019–2026 for "*zhongkao* PE". The average value of search volume. (A) The overall search trend index. (B) Personal computer search index. (C) Mobile wireless search index.

3.2. Geographic Distribution of Search Interest

Figure 2 depicts a comparison of the Baidu Index-generated China maps, demonstrating the regional-, provincial- and city-level search data from May 2019 to May 2026. Clear geographic patterns were shown with darker blue areas representing a higher search volume. The maps

showed higher search intensity in eastern and southeastern China, particularly in coastal and highly urbanized areas.



Source: Baidu index

Figure 2. Baidu index maps for "Zhongkao PE" by region (A), province (B), and city (C), May 2019– May 2026.

Table 1 presents provincial and city rankings of search volume for "*Zhongkao* PE". At the provincial level, the highest search volumes were concentrated in coastal and economically developed regions: Guangdong (1st), Zhejiang (2nd), Jiangsu (3rd), Fujian (4th), and Beijing (5th). Yunnan, despite being the first province to raise the PE score to 100 points, did not rank in the top 10. At the city level, the highest search indices were observed in Beijing, Shanghai, Hangzhou, Shenzhen, and Guangzhou – all first-tier or new first-tier cities.

Table 1. Provincial and City Rankings of Search Volume for "Zhongkao PE" (May 2019 – May 2026)

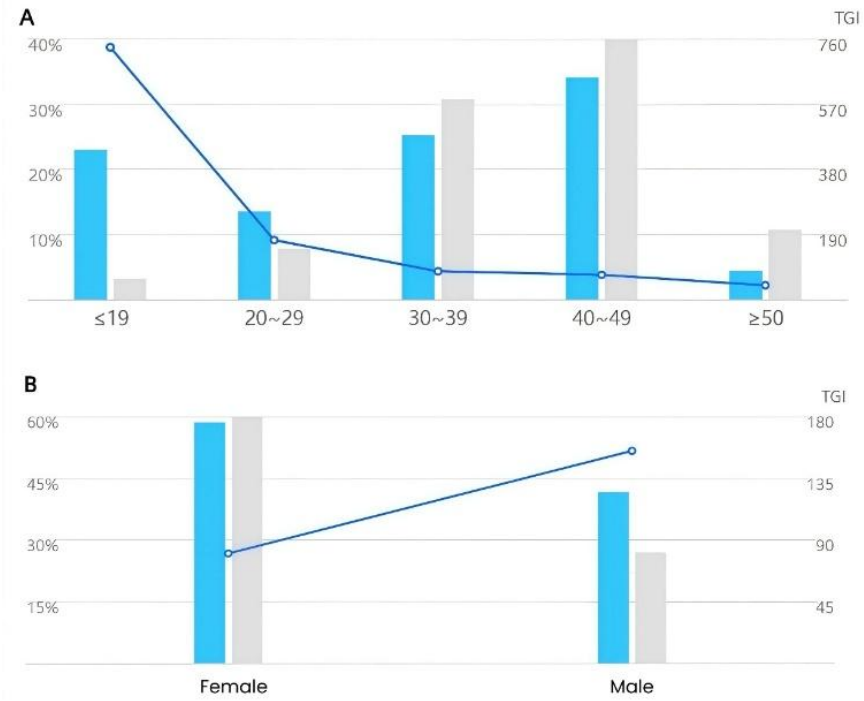
Provinces	Rank	Cities	Rank
Guangdong	**1**	Beijing	**1**
Zhejiang	**2**	Shanghai	**2**
Jiangsu	**3**	Hangzhou	**3**
Fujian	**4**	Shenzhen	**4**
Beijing	**5**	Guangzhou	**5**
Shandong	**6**	Fuzhou	**6**
Hubei	**7**	Changsha	**7**
Hunan	**8**	Wuhan	**8**
Shanghai	**9**	Tianjin	**9**
Anhui	**10**	Wenzhou	**10**

Source: Baidu index

3.3. Demographic profile of searchers

Figure 3 presents the demographic profile and TGI values of users searching for "*Zhongkao* PE". Users aged 30–49 years accounted for the largest share of searches, together representing approximately 59% of all search activity. Users aged ≤19 years accounted for approximately 24% of searches. However, the TGI values indicated that the ≤19 age group had the highest relative concentration among all age groups, suggesting that adolescents were over-represented among searchers compared with their baseline share in the general internet-user population.

In terms of gender distribution, female users accounted for a larger absolute share of searches than male users, approximately 60% versus 40%. However, the gender-specific TGI values should be interpreted separately from absolute proportions. Although females generated a greater share of searches overall, the TGI pattern suggested that male users were relatively more concentrated among "*Zhongkao* PE" searchers.



Source: Baidu index

Figure 3. Demographic profiles by age (a) and sex (b).

4. Discussion

This study used Baidu Index data to examine how public online attention to *Zhongkao* PE changed before and after the 2020 national reform. The findings show that search activity increased markedly after 2021, displayed recurrent seasonal peaks around examination periods. These patterns suggest that *Zhongkao* PE attracted sustained public online attention after PE became more closely linked to high-stakes educational assessment.

The device-specific results further showed that the overall search pattern was mainly driven by mobile searches, whereas the PC search index declined over time and did not closely match the overall trend. This pattern is consistent with the broader shift toward mobile internet use in China (Wang et al., 2020). It also suggests that mobile-based platforms may be particularly important channels for communicating PE-related policy information to students, parents, and schools.

The post-reform increase in search activity is particularly important because it may reflect a change in the perceived status of PE within the education system. Traditionally, PE in China was a non-core subject focused on health promotion. However, once it is involved with *Zhongkao* admissions, PE became a subject that could affect educational progression and therefore required strategic preparation. Online search behavior may therefore serve as an

indirect indicator of how students, parents, teachers, and other stakeholders respond to the changing role of PE in high-stakes assessment.

This interpretation is consistent with the literature on assessment washback. Washback theory suggests that tests can influence teaching, learning, and the allocation of educational attention (Alderson & Wall, 1993; Lalremchhungi & Fanai, 2023; Rathnayake, 2024). In high-stakes assessment systems, "what is assessed becomes what is valued, which becomes what is taught" (Cheng & Curtis, 2004, p.2). Campbell's law further warns that when quantitative indicators are used for social decision-making, they may distort the processes they are intended to monitor (Campbell, 1979). Applied to *Zhongkao* PE, the increase in public attention may reflect both the strengthened status of PE and the risk that schools and families may treat physical activity mainly as exam preparation rather than as a long-term health behavior.

This potential shift toward exam-oriented preparation is particularly important in PE because quality physical education cannot be reduced to measurable fitness outcomes. High-quality PE requires alignment among curriculum, pedagogy, and assessment in ways that support learning, participation, and lifelong engagement in physical activity (Penney et al., 2009). However, fitness testing in PE has often been criticized because its contribution to healthy lifestyles and sustained physical activity cannot be assumed. Additionally, poorly implemented testing may be demotivating and counterproductive to young people's engagement in physical activity (Cale & Harris, 2009). In the Chinese context, likewise, Yang et al. (2025) found that students perceived Shanghai's high-stakes *Zhongkao* PE test as overly focused on physical performance and insufficiently aligned with the broader educational value of PE. The present study adds a nationwide digital perspective to this debate by showing that PE examination reform was accompanied by sustained online attention beyond the school setting.

The geographic distributions further suggest that the public online-searching response to *Zhongkao* PE was socially and regionally uneven. Search activity was concentrated in coastal and highly urbanized regions, whereas Yunnan, despite being the first province to implement the 100-point *Zhongkao* PE reform, did not appear among the top-ranking provinces. This finding suggests that search activity may be shaped by regional educational competition, socioeconomic development, internet use, and access to commercial training resources.

One possible explanation for this geographic pattern is that *Zhongkao* PE may have become connected to family investment and *shadow education*. Research on shadow education shows that families often respond to competitive examinations by investing in supplementary learning

opportunities outside formal schooling (Bray, 2021; Byun, 2014; Entrich, 2018; Entrich & Lauterbach, 2019). This tendency may be stronger among families with greater economic and social resources. Our geographic data that showed concentration of searches in economically developed and highly urbanized regions is consistent with this interpretation. In China, parents have been described as increasingly "responsibilised" actors who manage educational uncertainty through private educational investment (Liu & Bray, 2022), while tutorial companies tend to concentrate in densely populated urban areas where demand is higher (Zhang & Bray, 2021). These perspectives help explain why *Zhongkao* PE may have become a new domain of family information gathering and possible training investment. This interpretation also aligns with the 2021 *Mass Fitness Behavior and Consumption Research Report*, which reported that 67% of parents believed sports–education integration policies would influence their spending on children's sports training, and 76% considered PE-exam-oriented training classes necessary (cited in Zhang, 2021).

Demographically, the findings suggest that both adult caregivers and adolescents were involved in searching for *Zhongkao* PE-related information. Users aged 30–49 years contributed the largest absolute share of searches, which may reflect parental concern with examination preparation. In contrast, users aged ≤19 years showed a high relative concentration according to TGI values, suggesting that adolescents themselves were also visible information seekers. This dual pattern suggests that *Zhongkao* PE reform may have affected both parental information-seeking and students' own preparation concerns. The gender findings should also be interpreted cautiously. Although female users accounted for a larger absolute share of searches, the TGI results showed a different pattern from the absolute search proportions. This suggests that gender differences in PE-related search behavior require further investigation. Baidu Index data alone cannot explain the underlying reasons for this pattern. Future survey or qualitative research should investigate this gender disparity further.

These findings have important implications for PE policy and school communication. If the purpose of *Zhongkao* PE reform is to promote youth health and lifelong physical activity, policy communication should not be limited to scoring criteria and examination procedures. Authorities and schools should also provide guidance on safe and appropriate preparation, injury prevention, balanced physical activity, and make students aware of the educational purpose of PE. Otherwise, the reform may unintentionally lead to exam-oriented preparation, in which physical activity is valued primarily as an examination task rather than as a health-promoting activity. Such guidance may be especially important in less-developed regions,

where families may have fewer informational and financial resources to respond to policy change.

Overall, this study shows that *Zhongkao* PE reform was accompanied by sustained online search attention, especially around examination seasons and in economically developed regions. These patterns suggest that high-stakes PE assessment may influence not only school practices but also family information-seeking and regional responses to education policy. Baidu Index data cannot replace survey, interview, or administrative data, but they can complement these methods by capturing population-level patterns of online attention over time and across regions. Future research should combine search data with survey measures of perceived pressure, parental investment, training participation, student well-being, injury risk, and objective physical activity or fitness outcomes. Such mixed-methods research would help clarify how online information-seeking is connected to actual experiences and behaviors under high-stakes PE assessment.

This study has several limitations. First, the analysis was based solely on Baidu Index data. Although Baidu is a major Chinese-language search platform, the results do not capture searches conducted through other search engines, social media platforms, short-video platforms, or offline information channels. Future research should consider integrating other internet-based data sources, such as the Weibo Index (Jiang et al., 2015) and WeChat Index (Fan et al., 2021). Furthermore, the study used a single keyword "*Zhongkao* PE" as it directly refers to the PE component of the *Zhongkao*. However, some related searches may not have been captured. For example, users searching for more specific terms such as "*Zhongkao* PE full-score techniques", "PE training centers", or "jump-rope training" would not be included unless their query contained the selected keyword. Some more specific keywords were also not indexed or did not provide continuous usable data in Baidu Index, which limited the feasibility of a multi-keyword strategy. As a result, this study may underestimate the broader volume of PE-examination-related information seeking. Additionally, Baidu Index provides aggregated and anonymized search statistics. The platform does not allow researchers to identify individual users or determine their specific motivations. A search for "*Zhongkao* PE" may originate from students, parents, PE teachers, school administrators, journalists, researchers, or commercial training providers. These different actors may have distinct informational needs, but they cannot be separated in the current data. Finally, search volume reflects online information-seeking behavior rather than offline behavior or psychological states. Future studies should combine search data with survey, interview, and longitudinal data to examine how online

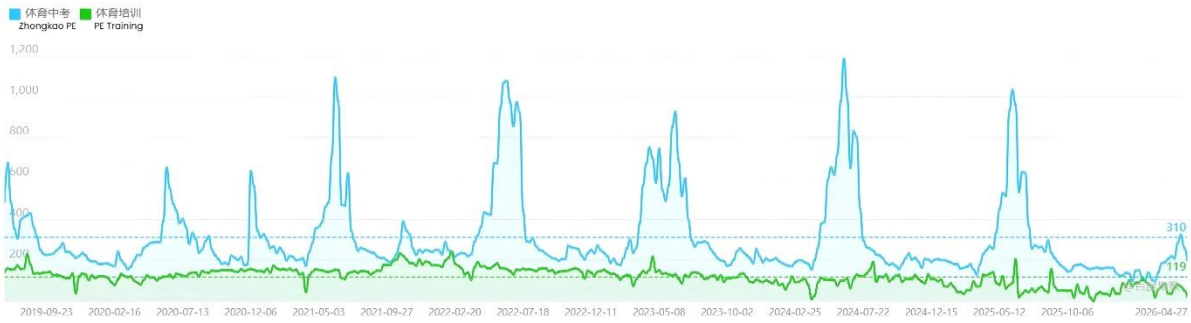
information-seeking is related to perceived pressure, parental investment, training participation, student well-being, and fitness outcomes.

5. Conclusions

This study analyzed Baidu Index data from 2019 to 2026 to investigate the online information-seeking behavior, after the PE reform new policy was issued in 2020. These findings suggest that increasing the score weight of PE can raise public attention to school physical education, but it may also encourage families and schools to approach physical activity through a test-oriented logic. Therefore, policymakers should ensure that *Zhongkao* PE reform remains aligned with its broader health-promoting purpose. In addition to clarifying scoring criteria and assessment procedures, education authorities and schools should provide guidance on safe preparation, injury prevention, balanced physical activity, and the educational value of lifelong exercise. Future research should integrate search data with surveys, interviews, and objective physical activity or fitness outcomes to examine how online information-seeking relates to students' actual experiences, family investment, training participation, and well-being under high-stakes PE assessment.

Disclosure

Supplementary Materials



Source: Baidu index

Supplementary Figure S1. Comparison of Baidu Index search volume for "体育中考" (*Zhongkao* PE) and "体育培训" (PE training), during May, 2019– May, 2026.

Author contributions

The first author Xiaodan Zhang performed the data retrieval and analysis and wrote the original draft. The corresponding authors Jiali Yao and Luyan Teng contributed to manuscript review and editing. Both authors read and approved the final manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The data that support the findings of this study are publicly available from the Baidu Index platform (https://index.baidu.com) and were accessed under its terms of use. The data pertain to keyword search queries for "体育中考" (*Zhongkao* PE) spanning the period from May 1, 2019, to May 1, 2026. These data are aggregated and anonymized by the platform to protect individual privacy.

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