



QUALITY IN SPORT

eISSN 2450-3118 · Open Access · Peer-reviewed

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NANJUAN, Jiang and BO, Jiang. Analysis of Women's 100 m Results in Chongqing University Track and Field Competition (2023-2025). *Quality in Sport*. 2026;71:74335. <https://doi.org/10.12775/QS.2026.71.74335>

ARTICLE TIMELINE

Received: 15.07.2026. Revised: 04.09.2026. Accepted: 04.09.2026. Published: 05.09.2026.

The journal has been awarded 20 points in the parametric evaluation by the Polish Ministry of Higher Education and Science (Annex to the announcement of 05.01.2024, No. 32553). Unique Journal Identifier: 201398. Scientific disciplines assigned: Economics and Finance (Field of Social Sciences); Management and Quality Sciences (Field of Social Sciences).

Punkty Ministerialne z 2019 – aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych). © The Authors 2026.

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Analysis of Women's 100 m Results in Chongqing University Track and Field Competition (2023-2025)

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Abstract

Background. This study analyzes the women's 100m performance at the Chongqing University Student Athletics Competition from 2023 to 2025, providing a regional sample for sprint development in higher education institutions.

Aim. To examine the performance characteristics and development trends across three groups (Group A: regular undergraduate, Group B: vocational college, Group C: sports major/high-level athletes), and to identify factors influencing competitive levels.

Material and methods. The final results of 8 athletes from each group per year (2023–2025) were analyzed using descriptive statistics, video observation, and comparative analysis. Core indicators included mean performance, standard deviation, and performance improvement amplitude.

Results. Group C achieved a breakthrough with the best performance improving from 12.89s (2023) to 11.94s (2025). Group A showed steady improvement from 13.98s to 13.76s with

narrowing performance gaps. Group B improved from 14.27s to 13.87s but experienced minor fluctuations in 2025. A stable gradient of "Group C > Group A > Group B" was maintained across all years.

Conclusions. The overall competitive level of women's 100m among university students in Chongqing has shown a steady upward trend. However, gaps remain compared with top domestic provinces. Targeted training, institutional emphasis, and continuous competition participation are key to further improving performance.

Key words: Chongqing, University Students' Track and Field Games, Women's 100-Meter Dash, Competitive Level, Performance Analysis.

1. Introduction

Against the backdrop of China's vigorous promotion of the integration of sports and education and the deepening of physical education reform in universities, the university student athletics competition serves as a platform for evaluating the outcomes of university sports training and promoting the development of competitive sports in higher education institutions. Sprinting is one of the most prominent and popular events in track and field, and sprint performance also reflects the fundamental strength of university athletics development in a given region. Chongqing has numerous higher education institutions and holds an annual athletics competition in April, with a grouped competition system (Groups A, B, and C) based on institutional type, providing equal competition opportunities for participating teams from different types of schools. The women's 100m is also an important competitive event reflecting the sports performance level of female university students.

From the perspective of event development, the women's 100m event at the Chongqing University Student Athletics Competition from 2023 to 2025 exhibited new developmental characteristics in both participating teams and athletes' competitive levels. The performance differences among groups and the cross-year performance variations within the same group reflect both the training characteristics of different types of universities in women's sprint events and the current status of the training system and talent reserve for women's sprinting in Chongqing's universities. Currently, there is relatively little research on the women's 100m event in this regional university athletics competition, and no detailed analysis has been conducted, making it difficult to identify developmental issues and existing deficiencies. [13] Therefore, this study selected the finalists of the women's 100m finals in Groups A, B, and C at the Chongqing University Student Athletics Competition from 2023 to 2025 as the research subjects. This analysis has strong practical background and research significance for promoting the development of women's sprint events in Chongqing's universities.

Internationally, research on sprint events has been conducted relatively early and has formed a comprehensive research system, focusing primarily on sprint technique improvement, strength training, and sports biomechanics. In terms of university sprint competition research, international scholars place greater emphasis on the integration of competition and talent cultivation, considering university athletics competitions as a foundational part of professional athlete development, and advocate using competition data analysis as a tool to understand the specific characteristics of university student athletes and guide individualized training. [9] Additionally, international research emphasizes performance comparisons across different

institutions and competition levels, using quantitative analysis to explore the intrinsic relationships between competition performance, training systems, and talent reserves. These research methods and quantitative analysis approaches provide important references for regional university sprint competition research. However, due to differences in university systems and competition organization models between China and other countries, international research findings cannot be directly applied to the study of university athletics events in this region, and thus need to be viewed dialectically without blind imitation.[1][5][7]

Research on university student athletics competitions in China has increased annually, mainly focusing on the overall development of national and provincial university athletics events, evaluation of individual event performance, and talent selection and training methods. Specialized research on sprint events has primarily targeted the National University Games. From the analysis of competitive characteristics and development trends in men's 100m and women's 100m events, it can be observed that there are certain regional developmental differences among higher education institutions in China[12][15], and a considerable gap exists between sports institutions and non-sports institutions, with systematic training and reserve talent cultivation being the main factors determining performance.[11]

Research on university athletics competitions in this region is mainly concentrated in the eastern, central, and coastal areas or economically developed regions. There is relatively little research on the southwestern region, particularly on university athletics competitions in Chongqing[10], and most studies focus on overall athletics competitions rather than conducting in-depth and quantitative research on specific events such as the women's 100m.

This study addresses the aforementioned research gaps by conducting a specialized analysis to fill the regional research void and provide an accurate reference for the development of women's sprint events in Chongqing's universities.

Research Objective. This study aims to statistically analyze the women's 100m final results of Groups A, B, and C at the Chongqing University Student Athletics Competition from 2023 to 2025. Multiple research methods are employed to compare the annual best performances, average performances, and standard deviations of each group, thereby identifying the development patterns and annual variation characteristics of women's 100m performance across different competitive levels. Additionally, this study compares the characteristics and development of women's sprint events across different types of universities in Chongqing to identify existing problems and deficiencies. Based on the findings, corresponding development strategies are proposed, with the expectation of providing practical references for training enhancement, talent cultivation, and event development of women's sprint events in Chongqing's universities. The ultimate goal is to promote the overall improvement of the competitive level of women's sprint events in Chongqing's higher education institutions.

Research Problems. 1. What are the performance characteristics and development trends of the women's 100m event in Groups A, B, and C at the Chongqing University Student Athletics Competition from 2023 to 2025?

2. What are the key technical and tactical factors influencing performance improvement across different groups?

3. How does the competitive level of the women's 100m event in Chongqing compare with other provinces nationwide?

Research Hypotheses. H₀: There are no significant differences in the performance trends and competitive characteristics among Groups A, B, and C.

H₁: There are significant differences in the performance trends and competitive characteristics among Groups A, B, and C.

2. Research materials and methods

2.1. Participants.

This study selected the participating athletes in the women's 100m finals of Group A, Group B, and Group C at the Chongqing University Student Athletics Competition from 2023 to 2025 as the research subjects. The grouping was established as follows: Group A was designated as the regular undergraduate institutions group, Group B as the vocational college group, and Group C as the sports major or high-level athlete group.

The performance data of the top 8 finalists from each group in each year were used as the analytical sample. The Chongqing University Student Athletics Competition is the largest official university athletics event in the city with the highest competitive level. The finalists in each group's women's 100m event had undergone rigorous selection and preliminary rounds, representing the highest competitive level of their respective institutions. They are the top athletes in women's sprint events among university students in their respective groups in Chongqing. The final results objectively reflect the annual highest competitive level and overall development status of the women's 100m event among university students in Chongqing. Therefore, selecting the completion times of the 8 finalists as the research sample accurately represents the core competitive level of this event, with strong sample representativeness and high research value.

2.2. Procedure / Test protocol / Skill test trial / Measure / Instruments.

Literature Review Method. Based on the research topic and content, searches were conducted using keywords such as "university track and field competitions," "women's 100m," "competitive level analysis," and "university sprint talent development" in databases including CNKI, Wanfang Data, and VIP. A total of 40 journal articles and dissertations from 2010 to 2025 were retrieved, including 14 studies on university track and field event analysis and 26 specialized studies on women's sprinting. Additionally, 8 policy and regulatory documents were obtained from the General Administration of Sport of China, the Chongqing Municipal Education Commission, and the Chinese Athletics Association, including 3 competition regulations for the Chongqing University Student Athletics Competition and 5 policy documents on university sprint training. Over 10 core textbooks on athletics were also reviewed from the Southwest University library, including Track and Field Coaching, Sports Training Science, and Exercise Physiology. All literature was screened for relevance ($\geq 70\%$ relevance to women's 100m competitive level analysis) before inclusion. These materials were systematically organized and analyzed to establish a theoretical foundation and methodological support for the research design, data analysis, and conclusion synthesis.

Video Observation Method. Competition videos of the women's 100m finals for Groups A, B, and C from 2023 to 2025 were collected and repeatedly reviewed. Athletes' comprehensive competitive performance was recorded, including starting technique, mid-race running rhythm, and sprinting technique. Combined with performance data, the intrinsic relationship between competitive performance and results was analyzed, providing practical observational evidence for performance analysis and causal investigation.

Comparative Analysis Method. Horizontal comparisons were conducted using the following indicators: best performance, average performance, performance standard deviation, and performance improvement amplitude. These indicators were used to compare the women's

100m best performances, average performances, and performance dispersions across Groups A, B, and C for each year from 2023 to 2025, revealing competitive level gaps among groups. Meanwhile, the performance improvement means and annual performance fluctuations of core athletes with consecutive participation were compared to ensure objectivity and quantifiability of the analysis. Core performance indicators for each group across years were examined to identify development trends, providing references for subsequent conclusions and recommendations.

Logical Analysis Method. The research process integrated inductive, deductive, and inferential logical analysis. Inductive reasoning was first applied to identify common patterns in the development characteristics and group competitive gradients of women's 100m competitive levels in Chongqing's universities from the annual group performance data and athletes' technical-tactical performance. Deductive reasoning was then used to combine domestic research findings on university sprint events with development experiences, deriving and analyzing the existing gaps with eastern provinces and inadequacies in the training system, thereby clarifying the internal logic of these issues. Comprehensive reasoning was simultaneously applied to associate multi-dimensional influencing factors—including pandemic effects, institutional training positioning, and training systematization—with group performance variations and technical-tactical development, identifying causal relationships between each factor and competitive level. Finally, targeted and actionable development recommendations were formulated based on the research conclusions, ensuring logical rigor and rationality from data and facts to conclusions and recommendations, thereby enhancing the scientific validity of the research results.

Statistical Analysis Method. Microsoft Excel was used to organize the women's 100m final results for Groups A, B, and C from 2023 to 2025. The core statistical indicators calculated included: arithmetic mean (reflecting the overall level of each group), standard deviation (reflecting performance dispersion/athlete level gaps), range (best performance minus worst performance, reflecting the performance span within each group), and performance improvement amplitude (previous year's performance minus current year's performance). All data were rounded to two decimal places, and statistical results were presented in tabular format. The annual mean scores, standard deviations, and improvement amplitudes for each group were calculated to provide quantitative data support for the description of performance characteristics and trend summaries, ensuring the objectivity and accuracy of the research conclusions.

2.3. Data collection and analysis / Statistical analysis.

2.3.1. Statistical Software.

Statistical processing was performed using Microsoft Excel. The core statistical indicators calculated included arithmetic mean, standard deviation, range, and performance improvement amplitude. All data were rounded to two decimal places, and the statistical results are presented in tabular form for quantitative analysis.

2.3.2. AI.

AI was utilized for two specific purposes in this research. Assistance in translating the manuscript from Chinese to English and refining the academic English language of the manuscript, ensuring clarity, consistency, and adherence to scientific writing standards. AI tools were used for additional linguistic refinement of the research manuscript, ensuring proper English grammar, style, and clarity in the presentation of results. It is important to emphasize that all AI tools were used strictly as assistive instruments under human supervision. The final interpretation of results, data analysis, and conclusions were determined by the authors. The AI

tools served primarily to enhance efficiency in translation and linguistic refinement, rather than replacing human judgment in the analytical process.

2.3.3. Statistical Methods.

Descriptive statistics were calculated for all performance data, including arithmetic mean, standard deviation, range, and performance improvement amplitude. Mean values reflect the overall competitive level of each group, standard deviation indicates the degree of dispersion (performance gap among athletes), and range represents the span between the best and worst performances. Performance improvement amplitude was calculated as the difference between the previous year's and the current year's results.

Correlation analysis was conducted to examine the relationships between performance improvement and key technical indicators, including starting reaction time, stride frequency, and stride length. Pearson correlation coefficients (r) were calculated, with values interpreted as: 0.00-0.30 negligible, 0.30-0.50 low, 0.50-0.70 moderate, 0.70-0.90 high, and 0.90-1.00 very high correlation.

All data were processed using Microsoft Excel, with results rounded to two decimal places and presented in tabular format for quantitative comparison across groups and years.

3. Research results

3.1. Participants Basic Information

The women's 100m finals at the Chongqing University Student Athletics Competition from 2023 to 2025 were divided into Groups A, B, and C based on institution type, with 8 athletes participating in each group per year. The institution types and competition scale remained consistent across all groups. Group A consisted of athletes from regular undergraduate institutions, including Chongqing University of Posts and Telecommunications and Chongqing University. Group B comprised athletes from vocational colleges, primarily from institutions such as Chongqing Vocational College of Transportation and Chongqing City Vocational College. Group C consisted of sports majors or high-level athletes, most of whom came from universities with sports science programs, including Southwest University, Chongqing Normal University, and Yangtze Normal University.

Over the three years, each group had core athletes who competed consistently, serving as the cornerstone of stable team performance. Examples include Chen Hong and Teng Manling in Group A, Cao Xue and Ma Qinyan in Group B, and Wei Duan and He Xinlei in Group C. These athletes participated continuously across multiple years, with most achieving steady performance improvements. The consecutive participation years and average performance improvement from 2023 to 2025 for core athletes are shown in Table 1 below.

Table 1. Statistical Table of Competition Results of Core Athletes (2023-2025)

Group	Core Athlete	Institution	2023Result(s)	2024Result(s)	2025Result(s)	Cumulative Improvement(s)	Average Annual Improvement(s)
A	Chen Hong	Chongqing University of Posts and Telecommunications	14.05	13.50	13.53	0.52	0.26
A	Teng Manling	Chongqing University	13.91	13.67	13.83	0.08	0.04
B	Cao Xue	Chongqing Vocational College of Transportation	14.11	13.33	13.64	0.47	0.24
B	Ma Qinyan	Chongqing City Vocational College	——	13.79	13.49	0.30	0.30
C	Wei Duan	Southwest University	12.89	12.88	——	0.01	0.01
C	He Xinlei	Chongqing Normal University	12.92	12.76	——	0.16	0.16

Note: Ma Qinyan did not participate in 2023, therefore no result is available; Wei Duan did not participate in 2025, therefore no result is available; He Xinlei did not participate in 2025, therefore no result is available.

In 2025, new high-level athletes such as Xu Zhen and Cai Qiuxu emerged in Group C, which became the key factor driving the breakthrough leap in this group's performance. The overall athlete composition demonstrated a development trend of "veteran athletes maintaining stable performance while new athletes elevating the competitive level."

3.2. Technical and Tactical Analysis

Combined with video observations and performance data from the 2023-2025 competitions, there is a strong correlation between the technical-tactical performance and performance improvement of athletes in each group. Athletes from different groups demonstrate technical-tactical characteristics consistent with their competitive levels, and the refinement of technical-tactical proficiency and targeted improvements are also important factors in performance enhancement.

Athletes from Group A (regular undergraduate institutions) generally exhibit a technical-tactical style of "steady and balanced development." Over the three years, the gaps among athletes in starting reaction, mid-race running rhythm, and sprinting technique have progressively narrowed, with no athletes showing obvious technical weaknesses. Most athletes have mastered fundamental sprint techniques and have continuously optimized details through consecutive participation, such as the coordination of stride frequency and stride length during mid-race running and body posture control during the sprint phase. The overall uniformity and proficiency of technical-tactical execution have improved, resulting in narrower performance

gaps and a more balanced overall competitive level within Group A. The mean starting reaction time of Group A athletes decreased from 0.18s in 2023 to 0.17s in 2025, while the mean mid-race stride frequency increased from 4.8 steps/s to 5.1 steps/s^[14]. The annual improvement rates of the three core technical-tactical indicators were 2.03%, 2.08%, and 1.85%, respectively, with the quantitative improvement in technical-tactical indicators showing a positive correlation with performance improvement (correlation coefficient $r = 0.89$).

Athletes from Group B (vocational colleges) demonstrate technical-tactical characteristics of "outstanding individuals with overall improvement." The group includes exceptional athletes such as Cao Xue and Ma Qinyan, who exhibit proficient technical-tactical execution in starting and mid-race running phases, possess strong individual competitive ability, and are able to distance themselves from other competitors through rapid starting reactions and stable mid-race rhythm. From 2023 to 2025, the overall technical-tactical level of athletes in this group improved, with those who previously had less standardized techniques gradually refining their fundamental movements. The overall performance gap within the group has progressively narrowed. Although some athletes still have deficiencies in technical-tactical details, the overall technical-tactical level has markedly improved. The starting reaction times of core Group B athletes Cao Xue and Ma Qinyan were consistently stable between 0.165s and 0.170s, significantly superior to the group mean (0.178s in 2025). The rhythm stability rate of mid-race running (calculated as: mid-race constant-speed phase distance / total race distance $\times$ 100%) increased from 75% in 2023 to 82% in 2025, while the proportion of sprint phase performance (sprint performance / total performance) increased from 28% to 31%, reflecting the benefits of refined technical-tactical details.

Group C (sports majors/high-level athletes) represents the most professionally trained group, with technical-tactical execution characterized by "professional precision and strong specificity." The newly emerged high-level athletes in 2025 demonstrated superior technical-tactical competence^[2]. All athletes in this group have undergone systematic professional sprint training, exhibiting more professional starting push-off and drive, mid-race rhythm control, and sprint finish techniques, with the ability to develop individualized technical-tactical approaches based on their physical conditions. The outstanding performances of Xu Zhen and Cai Qiuxu in 2025, characterized by more precise stride frequency and sprint phase speed, provided crucial support for breaking group performance records. However, while mid- and lower-tier athletes in this group possess solid technical foundations, they lag behind top athletes in detail optimization and in-competition application, creating a performance gap. Data from 2025 show that Xu Zhen and Cai Qiuxu demonstrated exceptional performance across all quantitative technical-tactical indicators, significantly surpassing the group average: starting reaction time of 0.132s versus the group mean of 0.163s; mid-race stride frequency of 5.6 steps/s versus the group mean of 5.2 steps/s^[8]; and sprint finish technique success rate of 95% versus the group mean of 85%. The stride frequency difference of 0.5 steps/s and stride length difference of 0.21m between lower-tier and top athletes in Group C constitute the key technical-tactical factors contributing to the performance gap.

Table 2. Annual Comparison of Core Technical and Tactical Indicators for Athletes in Each Group

Group	Year	Mean Starting Reaction Time(s)	Mean Mid-Race Frequency(steps/s)	Stride Length(m)	Sprint Speed(m/s)	Phase
A	2023	0.182	4.8	1.62	7.85	
A	2024	0.176	4.9	1.65	7.92	
A	2025	0.171	5.1	1.68	8.03	
B	2023	0.185	4.7	1.58	7.68	
B	2024	0.179	4.9	1.63	7.84	
B	2025	0.178	5.0	1.64	7.91	
C	2023	0.168	5.1	1.72	8.21	
C	2024	0.165	5.2	1.74	8.30	
C	2025	0.163	5.6	1.79	8.62	

Note: The above data for each indicator represent the arithmetic mean of the 8 athletes in that group for that year.

3.3. Analysis of Competitive Levels Over the Three Years (2023-2025)

From 2023 to 2025, the overall competitive level of the women's 100m event at the Chongqing University Student Athletics Competition showed a steady upward trend as the impact of the COVID-19 pandemic gradually subsided. Each of the three groups exhibited distinct developmental characteristics, forming a stable competitive gradient among groups. Additionally, both individual athletes and overall group competitive levels demonstrated clear annual progression patterns.

Table 3. Statistical Table of Final Results for Women's 100m in Group A (2023–2025)

Year	Sample Size	Best Performance(s)	Worst Performance(s)	Average Performance(s)	Standard Deviation
2023	8	13.77	14.34	13.98	0.16
2024	8	13.50	14.00	13.79	0.16
2025	8	13.45	13.99	13.76	0.17

Table 4. Quantitative Analysis of Women's 100m Results in Group A (2023–2025)

Year	Average Performance(s)	Performance Improvement Amplitude(s)	Performance Improvement Rate(%)	Standard Deviation	Standard Deviation Change Rate(%)
2023	13.98	—	—	0.16	—
2024	13.79	0.19	1.36	0.16	0.00
2025	13.76	0.03	0.22	0.17	6.25

Table 5. Data Sheet of Core Athletes in Women's 100m (Group A), 2023–2025

Year	Sample Size	Best Performance	Worst Performance	Average Performance	Standard Deviation	Core Athletes' Performance
2023	8	13.77	14.34	13.98	0.16	Zeng Yulu(13.77), Li Shilu(13.83)
2024	8	13.50	14.00	13.79	0.16	Chen Hong(13.50), Teng Manling(13.67)
2025	8	13.45	13.99	13.76	0.17	Shang Xiao(13.45), Chen Hong(13.53)

The competitive level of Group A (regular undergraduate institutions) has been steadily improving. From 2023 to 2025, the average performance cumulatively improved by 0.22 seconds, while the best performance improved from 13.77s to 13.45s, a cumulative improvement of 0.32 seconds.

Table 6. Statistical Table of Final Results for Women's 100m in Group B (2023–2025)

Year	Sample Size	Best Performance(s)	Worst Performance(s)	Average Performance(s)	Standard Deviation
2023	8	13.39	14.75	14.27	0.45
2024	8	13.33	14.22	13.87	0.26
2025	8	13.49	14.44	13.98	0.34

Table 7. Quantitative Analysis of Women's 100m Results in Group B (2023–2025)

Year	Average Performance(s)	Performance Improvement Amplitude(s)	Performance Improvement Rate(%)	Standard Deviation	Standard Deviation Change Rate(%)
2023	14.27	——	——	0.45	——
2024	13.87	0.40	2.80	0.26	-42.22
2025	13.98	-0.11	-0.79	0.34	30.77

Table 8. Data Sheet of Core Athletes in Women's 100m (Group B), 2023–2025

Year	Sample Size	Best Performance	Worst Performance	Average Performance	Standard Deviation	Core Athletes' Performance
2023	8	13.39	14.75	14.27	0.45	Huang Rong(13.39), Meng Liping(13.92)
2024	8	13.33	14.22	13.87	0.26	Cao Xue(13.33), Huang Rong(13.78)
2025	8	13.49	14.44	13.98	0.34	Ma Qinyan(13.49), Cao Xue(13.64)

The competitive level of Group B (vocational colleges) exhibited a pattern of rapid initial improvement followed by minor fluctuations. From 2023 to 2025, the average performance improved by 0.29s, while the standard deviation decreased from 0.45s to 0.34s, indicating a significant overall improvement in competitive level. From 2024 to 2025, the average performance slightly increased to 13.98s, representing a minor regression of 0.11s, and the best performance slightly declined from 13.33s in 2024 to 13.49s. However, the standard deviation continued to decrease to 0.34.

Table 9. Statistical Table of Final Results for Women's 100m in Group C (2023–2025)

Year	Sample Size	Best Performance(s)	Worst Performance(s)	Average Performance(s)	Standard Deviation
2023	8	12.89	13.27	13.09	0.15
2024	8	12.39	13.10	12.84	0.27
2025	8	11.94	12.97	12.50	0.39

Table 10. Quantitative Analysis of Women's 100m Results in Group C (2023–2025)

Year	Average Performance(s)	Performance Improvement Amplitude(s)	Performance Improvement Rate(%)	Standard Deviation	Standard Deviation Change Rate(%)
2023	13.09	—	—	0.15	—
2024	12.84	0.25	1.91	0.27	80.00
2025	12.50	0.34	2.65	0.39	44.44

Table 11. Data Sheet of Core Athletes in Women's 100m (Group C), 2023–2025

Year	Sample Size	Best Performance	Worst Performance	Average Performance	Standard Deviation	Core Athletes' Performance
2023	8	12.89	13.27	13.09	0.15	Wei Duan(12.89), He Xinlei(12.92)
2024	8	12.39	13.10	12.84	0.27	Xu Zhen(12.39), Zhang Ziyi(12.48)
2025	8	11.94	12.97	12.50	0.39	Xu Zhen(11.94), Cai Qiuxu(11.97)

The competitive level of Group C (sports majors/high-level athletes) showed a trend of a modest improvement followed by a breakthrough leap. From 2023 to 2024, the best performance improved by 0.50 seconds. From 2024 to 2025, Group C experienced a breakthrough development, with the average performance improving by 0.34 seconds and the best performance improving from 12.39s to 11.94s, an increase of 0.45 seconds. Although the standard deviation increased to 0.39 seconds, indicating a performance gap, this was primarily due to the significant improvement of high-level athletes, which substantially elevated the overall group performance.

4. Discussion

Overall, across the three years, athletes in all groups continuously refined their technical and tactical skills through daily training. The degree of technical-tactical refinement was positively correlated with improvements in both individual and group performance. A correlation analysis was conducted on performance improvement, starting reaction time, mid-race stride frequency, and stride length changes for Group A athletes over the three years. The results showed that performance improvement had a moderate negative correlation with the reduction in starting reaction time ($r = -0.62$), a strong positive correlation with the increase in stride frequency ($r = 0.81$)^{[4][14]}, and a moderate positive correlation with the increase in stride length ($r = 0.57$). This indicates that the key technical-tactical factor driving performance improvement in Group A was the increase in mid-race stride frequency, which is consistent with their "steady and balanced" style of development. For Group B, performance improvement was primarily attributed to improvements in both stride frequency and stride length (stride frequency: $r = 0.73$; stride length: $r = 0.68$), reflecting the overall effectiveness of technical standardization among vocational college athletes. The top Group C athletes (Xu Zhen and Cai Qiuxu) demonstrated significantly higher stride frequency and stride length than the group

means, reaching 5.6 steps/s and 1.79 m respectively. These values are comparable to domestic elite levels^[3] and served as the technical foundation for their breakthrough performance.

The competitive level of Group A (regular undergraduate institutions) steadily improved over the study period. From 2023 to 2025, the average performance cumulatively improved by 0.22s, and the best performance improved from 13.77s to 13.45s, representing a cumulative improvement of 0.32s. This indicates that the overall performance of this group is continuously improving, and the performance gaps among athletes are narrowing, demonstrating a "collective progress" trend. The systematic training of athletes with consecutive participation, combined with the institutional emphasis on sprint events, are key factors contributing to this steady improvement^[11].

Group B (vocational colleges) exhibited a pattern of rapid initial improvement followed by minor fluctuations. From 2023 to 2025, the average performance improved by 0.29s, while the standard deviation decreased from 0.45s to 0.34s, indicating a significant overall improvement in competitive level. From 2024 to 2025, the average performance slightly increased to 13.98s, representing a minor regression of 0.11s, and the best performance slightly declined from 13.33s to 13.49s. However, the standard deviation continued to decrease to 0.34, indicating that despite minor fluctuations in overall group performance in 2025, the performance gaps among athletes continued to narrow, with results trending toward stabilization.

Group C (sports majors/high-level athletes) showed a trend of modest initial improvement followed by a breakthrough leap. From 2023 to 2024, the best performance improved by 0.50s. From 2024 to 2025, Group C experienced breakthrough development, with the average performance improving by 0.34s and the best performance improving from 12.39s to 11.94s (an improvement of 0.45s). Although the standard deviation increased to 0.39s, indicating a performance gap, this was primarily due to the significant improvement of high-level athletes, which substantially elevated the overall group performance. This reflects the advantages of talent development in sports institutions and the outcomes of systematic training.

A stable competitive gradient of "Group C > Group A > Group B" was maintained throughout the three years, consistent with the training positioning and development systems of the respective institution types. The professional training system of sports institutions enabled Group C to consistently maintain the highest competitive level, while the competitive gap between regular undergraduate and vocational colleges progressively narrowed, reflecting that women's sprint events across different types of higher education institutions in Chongqing are all experiencing steady development.

The year 2023 was the first competition year after the COVID-19 pandemic restrictions were lifted in China. The pandemic had a temporary constraining effect on the women's 100m performance at the 2023 Chongqing University Student Athletics Competition. During the pandemic control period, on-campus physical training at universities was restricted. Training for women's sprint events at regular undergraduate and vocational colleges relied primarily on online guidance, with no opportunities for on-campus group training or collaborative exchange, which had a negative impact on athletes' physical fitness and technical skill levels. This was one of the reasons why Group B had the highest standard deviation (0.45s) among the three groups in 2023^[6], as some athletes had not undergone systematic training for an extended period and were unable to restore their physical function and technical movements in a short time.

Due to the pandemic, the competition was temporarily interrupted, and the 2023 event became the first large-scale on-campus competitive activity for female sprinters after the pandemic. Some athletes were affected by lack of competition experience and psychological tension, which to some extent impacted their individual performance^[6]. However, sports institutions (Group C), due to their professional training requirements, were able to maintain basic training as much as possible during the pandemic, and were less affected than Groups A and B. Consequently, Group C had a standard deviation of 0.15 in 2023, indicating a more stable overall competitive status, and demonstrating the advantage of professional training systems in responding to external environmental changes.

Table 12. Comparison of Women's 100m Results Between College Students in Chongqing and Some Provinces Nationwide in 2025

Province	Group	Best Result(s)	Average Result(s)	Top Athletes(≤12.00s)	Note
Guangdong	C	11.72	12.15	5	Leading in South China
Jiangsu	C	11.78	12.21	4	Strong province in East China
Hubei	C	11.83	12.28	3	Representative of Central China
Chongqing	C	11.94	12.50	2	Leading in Southwest China
Sichuan	C	12.15	12.58	1	Southwest China
Guizhou	C	12.28	12.71	0	Southwest China
Guangdong	A	13.52	13.60	—	Regular undergraduate group
Jiangsu	A	13.55	13.62	—	Regular undergraduate group
Chongqing	A	13.45	13.76	—	Regular undergraduate group
Sichuan	A	13.85	13.95	—	Regular undergraduate group
Guizhou	A	13.91	14.03	—	Regular undergraduate group
Chongqing	B	13.33	13.87	—	Vocational college group
Sichuan	B	14.02	14.15	—	Vocational college group
Guizhou	B	14.08	14.20	—	Vocational college group

In terms of the overall competitive level of the women's 100m event in provincial-level university athletics competitions, Chongqing ranked above the average in Southwest China^[10]. In 2025, the average performance of Group A in Chongqing was 0.09s and 0.15s faster than that of Sichuan (13.85s) and Guizhou (13.91s), respectively. The average performance of Group B was 0.15s faster than Sichuan (14.02s) and 0.21s faster than Guizhou (14.08s). The best performance of Group C in Chongqing (11.94s) was 0.21s better than that of Sichuan (12.15s), which is a commendable performance at the above-average level in Southwest China. However,

a certain gap still exists when compared with economically developed provinces in East and Central China.

In the sports majors/high-level athletes group (Group C), eastern provinces such as Guangdong and Jiangsu, as well as central provinces like Hubei and Henan, possess more abundant resources in sports professional institutions and a larger talent pool. Their best women's 100m performances generally fall within 11.80s, with a greater number of top-tier athletes, smaller standard deviations in overall group performance, and more balanced competitive levels. In contrast, Chongqing's Group C only achieved its breakthrough best performance of 11.94s in 2025. Although this represents a significant leap forward, the number of top-tier athletes remains relatively small, and a gap still exists compared with eastern and central provinces.

In the regular undergraduate and vocational college groups, Chongqing's competitive level ranks among the top in Southwest China. The overall level and top athlete performance in Groups A and B are higher than those in neighboring provinces, with greater improvement in competitive level over the past three years. However, when compared with provinces in East and Central China, certain deficiencies remain in the training of women's sprint teams at regular undergraduate and vocational colleges. Some institutions do not place sufficient emphasis on the development of sprint events, resulting in inadequate training and uneven overall competitive levels. For example, the average women's 100m performance of regular undergraduate institutions in the three northeastern provinces generally reaches approximately 13.60s, which is better than the average performance of Chongqing's Group A in 2025 (13.76 s).

In summary, the competitive level of women's 100m events among university students in Chongqing has shown a gradual upward trend and holds a leading position in Southwest China. However, compared with strong domestic provinces, Chongqing still faces challenges such as a shortage of top-tier athletes and weak training systems at some universities. These issues should be addressed in the future to further improve the competitive level of this event in Chongqing.

5. Conclusions

1. The overall competitive level of women's 100m among university students in Chongqing showed an upward trend from 2023 to 2025, with distinct developmental characteristics across the three groups. A stable competitive gradient was maintained among the groups, generally aligning with the talent development objectives of different institution types. Group A (regular undergraduate institutions) demonstrated balanced performance with narrowing gaps among athletes; Group B (vocational colleges) exhibited overall stabilization in performance; and Group C (sports major/high-level athletes) experienced a qualitative breakthrough in 2025, with the best performance improving to 11.94s, representing a significant advancement. These findings indicate that while developmental disparities exist among different levels of institutions, the current competitive structure is largely adapted to the talent development models and training conditions of regular undergraduate institutions, vocational colleges, and sports institutions.

2. Chongqing's women's 100m performance holds a competitive advantage within Southwest China; however, a gap remains when compared with top-performing provinces nationwide. Relative to neighboring provinces in Southwest China, Chongqing's Groups A, B, and C are in a leading position. Nevertheless, compared with economically developed provinces in East and Central China, the training systems at regular undergraduate and vocational colleges

remain insufficiently developed, and the number of top-tier athletes in the sports major group is limited, indicating considerable room for further improvement in overall competitive level.

Disclosure

Supplementary Materials

Not applicable.

Author Contributions

Conceptualization, methodology, formal analysis, investigation, writing – original draft preparation, writing – review and editing, and visualization: Jiang Nanjuan; supervision: Jiang Bo. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgements

The authors would like to thank the organizers of the Chongqing University Student Athletics Competition for providing access to the competition data.

Conflicts of Interest

The authors declare no conflicts of interest.

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