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Original Investigation

Comparison of Junior Wrestlers' Progression in Asia and Europe

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Purpose: The purpose of this study was to analyse the longitudinal career outcomes of wrestlers who participated in U20 European and Asian Championships between 2014 and 2022.

Methods: A total of 1,480 athletes competing in freestyle wrestling across all weight categories were included. Data on their careers, retrieved from the official United World Wrestling database, covered performances at U17, U20, U23, and senior-level international events (Continental, World Championships, and Olympic Games). Athletes were classified by U20 results (all participants, medallists, winners) and tracked across subsequent stages.

Results: The average number of participants per weight category was higher in Europe (13.04) than in Asia (9.15), indicating greater competition density. Performance analysis at U20 level revealed that 41.84% of Asian wrestlers became medallists, and 10.93% winners, compared to 28.75 and 7.67% in Europe ($P< .01$). European athletes, however, showed stronger continuity at subsequent stages: 62.65% of U20 participants had competed at U17 level and 52.25% advanced to U23, compared to 39.15 and 25.40% in Asia ($P< .01$). At senior Continental Championships, Asian wrestlers recorded a higher share of medallists (12.34 vs. 6.68%, $P< .01$), while European wrestlers demonstrated greater transition rates among medallists and champions. At the World Championships and Olympic Games, no statistically significant differences were found, with both continents showing broadly similar progression patterns.

Conclusions: While European athletes more often progressed through U17 and U23 stages, Asian wrestlers achieved comparable outcomes at the senior level, including World Championships and Olympic Games. Regional differences appear mainly at developmental stages, whereas elite-level performance converges, underlining the role of U20 competition and national systems in shaping future champions.

Keywords: junior, freestyle wrestling, athlete development, analysis, performance, technical skill.

Introduction

The analysis of athletic achievements serves as a key instrument in evaluating the effectiveness of athlete development across various stages of a sporting career. Competitive performance represents the most significant indicator of an athlete's sporting proficiency, reflecting their overall level of mastery [1,2]. This indicator becomes particularly meaningful when determined through direct opposition – such as in team sports or combat disciplines – where performance is assessed in relation to an opponent. Competition results can be used to trace the progression of athletic development, identify key periods of improvement or stagnation, and determine both internal and external factors that may influence sporting outcomes [3].

A systematic evaluation of competitive results enables coaches, sport managers, practitioners, athletes, and researchers to construct evidence-based training models, forecast future performance trajectories, and determine the most appropriate pathways for career advancement [4,5]. Furthermore, such analysis contributes to the refinement of talent identification systems, helps to prevent the loss of promising athletes, and enhances the stability of national team rosters. This approach, grounded in empirical data, provides a foundation for the development of effective long-term strategies aimed at cultivating high-performance athletes [6,7].

To assess long-term trends in athletic development, both retrospective and prospective analyses are employed. Retrospective analysis allows researchers to examine how early sporting achievements influence an athlete's future progression, while a prospective approach enables the modelling of future

performance based on prior results. Continuous monitoring of competitive dynamics is therefore essential for drawing conclusions regarding the effectiveness of athlete preparation systems. This methodology facilitates the identification of key aspects in the long-term development of elite athletes. Within the structure of long-term athlete development, international competitions at various age levels – such as U17, U20, and transitional categories overlapping with the senior level (e.g., U22 in boxing, U23 in wrestling) – play a crucial role as sequential stages in the formation of sporting expertise. Each of these categories is instrumental in the gradual preparation of athletes for the demands of senior-level competition [8,9].

Several longitudinal studies have explored how early competitive experiences influence athletes' long-term careers. Such researches are conducted systematically for various sports. While some athletes who demonstrate outstanding performance at these stages successfully transition to senior-level competition, others experience stagnation or attrition due to overtraining, burnout, or insufficient support systems. Research across different sports indicates that only a fraction of top-performing juniors achieve similar success as seniors, highlighting the importance of structured long-term development programs, psychological support, and gradual increases in competitive load. These findings underscore that early success serves as an indicator of potential rather than a guarantee of elite performance. However, there are also certain ambiguous or adverse trends associated with early competitive engagement, including athlete overtraining, premature specialisation, and inefficient developmental trajectories. In general, it should be noted that early success in categories such as U17 and U20 does not necessarily guarantee a successful senior career. Nevertheless, performance at these stages remains an important indicator of potential [10, 11].

At the same time, studies conducted where retrospective analysis is presented show that the most important stage for an adult career is stage U19/U20, among the earlier stages. These analyses indicate that athletes often follow distinct developmental trajectories, with some showing steady progression and others experiencing periods of plateau before reaching senior-level success. Such studies also highlight the role of structured competition and support during these transitional years, which can significantly influence the likelihood of a successful long-term career [12, 13]. Research is conducted systematically across different sports, providing comparative insights into how junior experiences translate into senior achievements. In general, experts note that U17 competition serves to identify initial athletic talent, while U20 reflects an athlete's capacity for sustained performance under conditions of heightened competition [3,14].

Also, recent research indicates that the U22/U23 category has emerged as a critical transitional phase, providing a smoother progression into senior-level sport and offering continued development opportunities for promising athletes who have not yet reached peak performance [15, 16].

A broad range of methodologies is applied in research related to combat sports, from basic counting of athletes and their achievements to complex temporal and technical–tactical metrics. Various aspects have been explored by scholars, including performance forecasting [17], time-motion analysis [18], and technical–tactical performance [19,20]. The predictive value of junior success in elite combat sports has also been investigated [21], as well as retrospective analyses and elite athlete profiles [22,] and the impact of competitive experience [23].

Simultaneously, studies comparing the success of athletes from different continents in both team and individual sports have demonstrated the significant influence of socio-economic and infrastructural factors on international performance outcomes [24, 25]. The ongoing globalisation of sport, and combat sports in particular, has facilitated the exchange of training methodologies, coaching expertise, and the international movement of athletes. As demonstrated in previous research, over half of the Olympic medals in wrestling have been won by athletes from European nations. However, analyses of recent Olympic Games suggest a levelling of competitiveness and a geographic shift of performance dominance toward the Asian region [26]. These dynamics make it increasingly relevant to conduct research comparing the international success of athletes from different continents at both junior and senior levels, as such analyses contribute to the refinement of athlete development programmes in a global context. Therefore, the purpose of this study was to analyse the longitudinal career outcomes of wrestlers who participated in U20 European and Asian Championships between 2014 and 2022.

Methods

Participants and Data Collection

This study included all participants of the U20/Junior European and Asian Championships (the official naming of the events varied) from 2014 to 2022. We examined the sports careers of athletes who competed in all weight categories in freestyle wrestling. In total, 1480 athletic biographies were analysed, including 913 European and 567 Asian wrestlers. Wrestlers from 36 European and 21 Asian countries participated in the U20 continental championships during the study period. The data were retrieved from the official website of United World Wrestling [27]. All recorded performances from the beginning of each athlete's competitive career were extracted from the United World Wrestling (UWW) database. The database is continuously updated after each international event, typically with a short delay of several days. For the purposes of this study, all available records were included up to the most recent data update as of May 2025, which represented the final point of data retrieval used in the analysis.

In this study, we considered international wrestling competitions across different age categories as defined by United World Wrestling. The U17 category (previously referred to as Cadets) includes athletes aged 17 years and younger. The U20 category (formerly Juniors) comprises athletes aged 18–20 years, while the U23 category, introduced more recently, includes athletes aged 21–23 years and serves as a transitional stage that partially overlaps with the senior level. The senior category is officially open to athletes aged 20 years and above, although in practice, some highly talented wrestlers may enter earlier. It should be noted that while the naming of age categories has evolved over time, the chronological age boundaries have remained consistent. For the purposes of this analysis, all competitions were standardised to the unified terminology of U17, U20, U23, and senior. It is also important to note that the U23 championships were established at different times across levels and continents — Europe in 2015, World in 2017, and Asia in 2019.

It is important to note that, due to COVID-19 restrictions, several continental championships were not held during the pandemic period. In Europe, the U17, U20, and U23 championships were cancelled for one competitive season, while in Asia, continental championships for the same age categories were not conducted for two consecutive years. Nevertheless, senior continental championships continued to be organised annually. For this analysis, only officially published results were included,

and all available data from adjacent years were used to ensure longitudinal consistency between continents [27].

Data Analysis

The sporting achievements of U20 continental championship participants were classified into several groups. The results of athletes from the European and Asian Championships were analysed separately to enable intercontinental comparison. The first classification criterion was based on performance at U20 continental events. Athletes were grouped into three categories according to their results: all participants, Medal winners (1st to 3rd place), and Winner (1st place). This classification enabled assessment of the relevance of achievements at the U20 level. The second criterion reflected the age category and competitive level in which U20 participants had competed. Specifically, we considered: Prior performance at U17-level international events; Subsequent achievements at U23 and senior-level competitions. For U17 and U23 levels, all international performances at Continental and World Championships were taken into account. For the senior level, which holds the highest significance in an athlete's career, performance was analysed separately for each major event: Continental Championships, World Championships, and the Olympic Games. Athletes' performances across all stages (prior and subsequent to U20) were categorised at three levels, corresponding to the U20 participant groups: Participation (qualification and national selection to represent the country at international events), Medallist (top-three placing and medal awarded), and Champion (winner of the event). For each group, the number of athletes was calculated in both absolute and relative terms (percentage of the total number in the group), allowing proportional comparisons across groups.

Statistical Analysis

Descriptive statistics were used to summarise the dataset. To assess statistically significant differences in proportions of successful athletes (i.e. participants, medallists, and champions) between Asia and Europe across various age groups and competition levels, a two-sample Z-test for proportions was applied. The significance threshold was set at $P < .05$. This test compared independent proportions, such as the percentage of medallists among all participants from each continent. In addition, the Chi-Square Test for Independence was used to determine whether a significant association existed between athletes' continental affiliation (Asia vs Europe) and their competitive outcomes (participation, medallist, or winner), based on contingency tables. All data processing procedures – including sorting, grouping, statistical calculations, and visualisation – were performed using Python 3.9 (Python Software Foundation, Wilmington, DE, USA).

Results

The average level of competition across weight categories varied between the two continents. Specifically, in Asia, the mean number of participants per weight category was 9.15 athletes, while in Europe it was 13.04 athletes, indicating a higher density of competitors at European championships. Performance analysis revealed that 41.84% of Asian wrestlers became medallists (1st–3rd place), and 10.93% secured victories (1st place). In comparison, 28.75% of European wrestlers achieved podium finishes, and 7.67% won their respective categories, suggesting a relatively lower success rate amid a larger pool of participants.

To evaluate the statistical significance of the differences between continents, a proportion analysis was conducted. The results demonstrated statistically significant differences in the share of medallists ($P = .001$) and champions ($P = .04$) between Asian and European athletes. Furthermore, the Chi-Square Test for Independence was applied to assess the overall association between region and competitive achievement level (participation/medallist/winner). This analysis also revealed a statistically significant relationship between athletes' regional affiliation and their performance outcomes ($\chi^2=18.42$; $P < .001$). Following the general characterisation of the U20 championship participants, the next step involved the analysis of their achievements at earlier (U17) and subsequent (U23) stages of their sporting careers. The distribution of athletes' past (U17) and future (U23) competitive achievements among U20 participants is presented in Table 1. The values in the column "The number of U20 participants" in Table 1 remain constant for the subsequent

Table 1. Number of wrestlers achieving success at Cadet (U17) and U23 levels among Junior (U20) continental championship participants.

Continent	Competitive group	The number of U20 participant	Participated at U17 level	Participated at U23 level
Asia	All participants	(*N*=567)	39.15% (*N*=222)	25.40% (*N*=144)
	Medal winners (1st–3rd)	(*N*=237)	51.48% (*N*=122)	36.29% (*N*=86)
	Winner (1st place)	(*N*=60)	55.00% (*N*=33)	46.67% (*N*=28)
Europe	All participants	(*N*=913)	62.65% (*N*=572)	52.25% (*N*=477)
	Medal winners (1st–3rd)	(*N*=262)	63.74% (*N*=167)	70.99% (*N*=186)
	Winner (1st place)	(*N*=67)	58.20% (*N*=39)	73.13% (*N*=49)

tables (Tables 2 and 3), as the analyses are based on the same cohort of athletes.

Participation at the cadet level (U17) revealed notable differences between continents. Among all U20 championship participants from Asia, 39.15% had previously competed at the cadet level, whereas this proportion was significantly higher among European athletes – 62.65% ($P< .001$). A similar trend was observed among medallists, with 51.48% of Asians versus 63.74% of Europeans having competed at the U17 level ($P= .01$). However, the difference among champions was smaller and statistically non-significant – 55.00% of Asian winners versus 58.20% of Europeans ($P= .69$). Overall, the Chi-Square Test for Independence confirmed a statistically significant association between continent and U17 participation ($\chi^2=76.72$, $P< .001$).

Regarding participation at the U23 level, European athletes similarly demonstrated a higher level of engagement. Specifically, 25.40% of U20 participants from Asia went on to compete at the U23 level, compared to 52.25% of European counterparts ($P< .001$). This advantage for European wrestlers was also evident among medallists (36.29% vs. 70.99%, $P< .001$) and champions (46.67% vs. 73.13%, $P= .001$). The Chi-Square Test for Independence revealed a statistically significant relationship between continent and U23 participation ($\chi^2=102.43$, $P< .001$).

The next stage of the analysis focused on the athletes' performances at the senior level, which represents a critical phase in a sports career. Specifically, the study sequentially examined their achievements at the Continental Championships (European and Asian Championships), the World Championships (Table 3), and the Olympic Games.

The results are shown in Table 2, which presents the achievements of Asian and European athletes at senior Continental Championships, depending on their U20-level success.

Table 2. Future achievements of wrestlers on the Continental Championships depending on their previous U20 level of success.

Continent	U20 Level	The number of U20 participant	Participant	Medallist	Winner
Asia	All participants	(*N*=567)	28.75% (*N*=163)	12.34% (*N*=70)	2.82% (*N*=16)
	Medal winners (1^{st}–3^{rd})	(*N*=237)	37.55% (*N*=89)	21.94% (*N*=52)	5.91% (*N*=14)
	Winner (1^{st} place)	(*N*=60)	45.00% (*N*=27)	31.67% (*N*=19)	10.00% (*N*=6)
Europe	All participants	(*N*=913)	26.07% (*N*=238)	6.68% (*N*=61)	1.53% (*N*=14)
	Medal winners (1^{st}–3^{rd})	(*N*=262)	44.27% (*N*=116)	19.08% (*N*=50)	5.34% (*N*=14)
	Winner (1^{st} place)	(*N*=67)	52.24% (*N*=35)	31.34% (*N*=21)	13.43% (*N*=9)

A comparative analysis of participation, medal attainment, and victories at senior European and Asian Championships among athletes who had previously competed at the U20 level revealed only minor differences between continents. The proportion of athletes who became medallists (1st–3rd place) was 12.34% among Asian wrestlers and 6.68% among European athletes, with the difference found to be statistically significant ($P< .001$). In addition, the Chi-Square Test for Independence confirmed a statistically significant association between overall continental affiliation and athletes' success ($\chi^2=13.91$, $P= .001$).

It is also worth noting that among former U20 medallists (1st–3rd place), 37.55% of Asian athletes went on to compete at the senior continental level, compared to 44.27% of Europeans. Furthermore, among U20 champions (1st place), 45.00% of Asians and 52.24% of Europeans later participated in senior-level championships. However, no statistically significant differences were identified in these latter comparisons.

The overall participation rate at the World Championships was moderate among both Asian and European athletes: 14.29% of Asian wrestlers who had competed at the U20 level later participated at the World Championships, compared to 17.42% of their European counterparts. Among U20 medallists (1st–3rd place), 19.41% of Asians and 33.21% of Europeans went on to compete at the World Championships ($P= .001$). For U20 champions, these figures rose to 23.33% and 37.31%, respectively ($P= .08$). However, the Chi-Square Test for Independence revealed no statistically significant association between the athletes' continental affiliation (Asia vs Europe) and their competitive success at the World Championships.

The next stage of the analysis focused on the athletes' future achievements at the Olympic Games, which represent the highest level of success in wrestling. The overall participation rate of former U20 wrestlers in these competitions was low across both continents. Among all U20 participants, only 3.53% of Asian and 2.85% of European wrestlers went on to compete at the Olympic Games. The results of statistical analysis did not reveal any significant differences between the continents for any of the examined indicators. Also, no statistically significant difference was found in the comparison of the proportion of Olympic medallists among all U20 participants ($P= .16$). Moreover, the Chi-Square Test for Independence indicated no statistically significant association between the athlete's continental origin and their subsequent Olympic achievements.

Discussion

Comparative studies on sports development and athletic success across different regions of the world have a long-standing tradition, and their relevance has grown in the context of ongoing geopolitical transformations. Following the dissolution of the Soviet Union [28] and the establishment of the European Union [29], scholarly interest in examining national sports systems and their adaptation strategies in response to new political and economic realities has intensified. Such research is crucial for shaping evidence-based governmental sports policies, promoting the exchange of best practices, and accounting for both unified

Table 3. Future achievements of wrestlers on the World Championships depending on their previous U20 level of success.

Continent	U20 Level	The number of U20 participant	Participant	Medallist	Winner
Asia	All participants	(*N*=567)	14.29% (*N*=81)	2.65% (*N*=15)	.53% (*N*=3)
	Medal winners (1st–3rd)	(*N*=237)	19.41% (*N*=46)	5.06% (*N*=12)	1.27% (*N*=3)
	Winner (1st place)	(*N*=60)	23.33% (*N*=14)	6.67% (*N*=4)	3.33% (*N*=2)
Europe	All participants	(*N*=913)	17.42% (*N*=159)	3.18% (*N*=29)	.66% (*N*=6)
	Medal winners (1st–3rd)	(*N*=262)	33.21% (*N*=87)	8.39% (*N*=22)	2.29% (*N*=6)
	Winner (1st place)	(*N*=67)	37.31% (*N*=25)	13.43% (*N*=9)	4.48% (*N*=3)

principles and local specificities. Despite the fact that the structure of athlete development systems and the organisation of competitions in many Olympic sports has been standardised internationally [7], national differences remain a significant determinant of performance.

Previous research by De Bosscher et al., [30] demonstrates that international sporting success is largely influenced by the availability of resources and the structural organisation of the national sports system. Also, recent review studies point to notable regional disparities in the analytical approaches adopted toward sports performance [31]. Furthermore, contemporary research confirms that national sports management and policy frameworks play a decisive role in shaping athlete development pathways, influencing the transition from youth to elite levels through talent identification, funding, and coaching infrastructure [32]. In addition, another critical determinant of athlete progression is the prevalence and management of sports injuries, as injury prevention strategies and access to medical support can substantially affect long-term athletic continuity. However, this issue extends beyond the primary focus of the present study and warrants more specialised investigation in future research [33].

The findings of our study corroborate the existence of such intercontinental differences, particularly in the developmental trajectories of wrestlers from Asia and Europe. These results highlight the role of regional context as a contributing factor to athletes' long-term performance outcomes. These findings are echoed in the study by Güllich and Barth [14], which concluded that participation in junior development programmes positively influences youth performance, yet does not consistently correlate with long-term senior success [34]. In the context of wrestling, a link between performance in the U17/U20 age groups and subsequent involvement in senior-level international competitions is also observed. According to research, over 60.00% of medal winners and more than 75.00% of champions at the European Junior Championships continued their careers at the senior level [35]. Our findings suggest lower transition rates among Asian athletes, with fewer than 40.00% of medal winners and 45.00% of champions participating in senior continental championships. Among European representatives, these figures were 44.27% and 52.24%, respectively. However, it is important to note that our analysis was limited to continental-level competitions, whereas the referenced studies considered all official senior-level events.

Another aspect highlighting regional disparities is the level of athlete involvement in the U17 category. According to our data, 39.15% of Asian participants at the U20 championships had previously competed at the cadet level, compared to 62.65% among their European counterparts ($P< .01$). Similar trends were observed among medallists (51.48 vs. 63.74%) and champions (55.00 vs. 58.20%), suggesting a potentially greater emphasis on the cadet stage within the European athlete development system. In contrast, Japan – one of the global leaders in wrestling – follows a distinct development pathway: as noted by Kinugasa and Gulbin [36], talented athletes typically begin competing professionally at the national level at the age of 15–16, which coincides with the period when most European athletes participate in international cadet competitions.

When interpreting the findings for the U23 category, it should be acknowledged that direct statistical comparisons between continents are not fully appropriate. The temporal disparity in the establishment of U23 competitions – with European events introduced earlier (2015) than in Asia (2019) – meant that athletes had unequal opportunities to participate. Our findings reveal that only 25.40% of Asian U20 participants went on to compete at the U23 level, in contrast to 52.25% of European athletes. A similar discrepancy was observed among medallists (36.29 vs. 70.99%) and champions (46.67% vs. 73.13%). Therefore, the results presented in this section should be regarded as descriptive and illustrative rather than confirmatory evidence of performance differences. Nevertheless, previous studies have highlighted the crucial developmental role of U23 competitions, which provide athletes with an important transitional stage before reaching senior-level success [15].

Based on the data obtained, it was established that the level of competition on the European continent is higher than in Asia. Specifically, the average number of participants per weight category was 13.04 in Europe compared to 9.15 in Asia, indicating greater density of rivalry. As the number of participants increases, the level of competition naturally intensifies, which reduces the overall proportion of athletes able to reach medal positions – a pattern clearly reflected in the present results (28.75% of European and 41.84% of Asian wrestlers became medallists). An analysis of the athletic progression of U20 participants showed that, regardless of continent, the overall trajectory of achievements at the senior level was broadly similar. Participation in continental championships, world championships, and the

Olympic Games revealed comparable rates between athletes from Asia and Europe. In most cases, no statistically significant differences were recorded. The only statistically significant difference was identified in the proportion of medallists among all participants at the continental level ($P < .05$), which was also confirmed by the Chi-Square test ($\chi^2=13.91$, $P= .001$). All other differences were either minor or showed only marginal trends. At the level of world championships and Olympic Games, the differences between the continents were even less pronounced. The proportion of athletes who participated or won medals did not differ significantly, although a slight advantage was observed in some categories. No statistically significant difference was found in the proportion of Olympic medallists among all U20 participants ($P = .16$), although the observed tendency aligns with the higher number of medals achieved at the most recent Olympic Games. At the same time, analysis of senior-level achievements indicates broadly similar progression patterns between continents, with only minor or statistically insignificant differences recorded at the World Championships and Olympic Games. The level of domestic competition within national systems thus appears to be a decisive factor in shaping future elite athletes [14,37].

It should be noted that this study has several limitations. Firstly, the analysis was based exclusively on a limited set of quantitative indicators, which does not allow for a comprehensive assessment of all aspects of athlete training and development. Secondly, the research focused solely on international achievements recorded in the official databases of the international federation, without accounting for national-level competitions or participation in unofficial events. An important direction for future research on athlete development could be to investigate the influence of emerging technologies – such as artificial intelligence, biomechanical analysis, and other innovative tools – which are rapidly evolving and may play a significant role in shaping training and performance outcomes. Furthermore, a limitation is the relatively small sample size of athletes who competed in the Olympic Games, which complicates the interpretation of results, particularly regarding the increased performance of Asian athletes at this level. It is also important to consider that, geopolitical changes may affect, due to sanctions related to the full-scale invasion of Ukraine by the Russian Federation, the national teams of Russia and Belarus were barred from Olympic participation. It should also be noted that this had limited impact on the preparation of the Ukrainian national team. This exclusion may have influenced the overall competitive landscape and medal distribution, particularly within European countries. However, the national teams of the Russian Federation and Belarus were largely represented at continental and world-level competitions under neutral flags. At the same time, athlete migration also has a significant impact, as some athletes from these countries participated in the Olympic Games and achieved success under the flags of other nations, and these results were accounted for in our analysis. Overall, assessing the influence of such geopolitical events, migration processes, and other related factors is challenging and represents a distinct direction for future research. These processes occur continuously across all regions of the world and affect athletes' opportunities to achieve results in specific competitions. Year-by-year dynamic analysis would provide more detailed insights, but the aim of our study was to present outcomes across the entire period.

Practical Applications

This study demonstrates that participation in junior-level competitions (U17–U20) and transitional stages such as U23 is a strong predictor of future senior success. Coaches and sport administrators can use these insights to optimise long-term athlete development, regardless of regional differences. While limitations exist, the findings provide a practical basis for refining training strategies in wrestling and similar sports.

Conclusions

The study examined the long-term sporting trajectories of freestyle wrestlers who competed at the U20 continental championships in Asia and Europe between 2014 and 2022. The results revealed that while European athletes demonstrated higher participation rates at both U17 and U23 levels, athletes from both continents showed comparable progression to senior-level competitions. Statistically significant differences were found in a few indicators, particularly the proportion of continental medallists and U23 participation. However, no major disparities were observed at the World Championships or Olympic Games. These findings suggest that participation at the U20 level may serve as one of several important indicators – rather than a definitive predictor – of future success. Overall, the results emphasise the importance of athlete development structures, national competition systems, and sustained progression opportunities in shaping the transition from junior to elite performance.

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Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Ethical Committee approval

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The authors have no conflicts of interest to declare.

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Author-s contribution

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