

Manuscript title: Exploring the physical attributes of elite épée fencing: A delphi study of world-class coaches.

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ABSTRACT

BACKGROUND: This study aimed to identify and rank the physical attributes deemed most important for elite performance in épée fencing, from the perspective of world-class coaches. While extensive biomechanical and physiological research exists in fencing, limited attention has been paid to the experiential insights of elite coaches.

METHODS: A modified Delphi method was employed to gather expert consensus from 26 international épée coaches with Olympic-level experience. In Round One, open-ended responses were thematically analysed to identify key physical attributes, which were consolidated into nine overarching themes. In Round Two, coaches ranked these attributes in order of importance. Stability of rankings was assessed using Kendall's coefficient of concordance (W).

RESULTS: Twenty-nine distinct physical attributes were identified in Round One and grouped into nine themes. In Round Two, agility (mean rank = 2.9) and reaction time (3.3) emerged as consensus-high priorities, while strength (7.6) and power were consensus-low. Aerobic fitness (5.7) and flexibility showed polarised distributions, reflecting entrenched differences in coaching philosophies. Agreement

among coaches was acceptable but limited ($W = 0.26$), indicating stable but divergent viewpoints rather than instability.

CONCLUSION: Elite coaches prioritised agility, reactivity, and speed in épée fencing, aligning with performance demands observed in biomechanical studies. However, the undervaluation of foundational qualities such as strength and aerobic fitness highlights a partial disconnect with sport science evidence. These findings underscore the need for enhanced coach education, interdisciplinary collaboration, and a more balanced emphasis on physical preparation that supports both performance and injury prevention. The study also demonstrates the value of Delphi methodology in capturing diverse expert perspectives even when full consensus is not achieved.

KEY WORDS: FENCING – DELPHI METHOD – PHYSICAL FITNESS – MOTOR CONTROL – ATHLETIC PERFORMANCE

INTRODUCTION

Fencing, with origins tracing back to 1200 BC ¹, has evolved from an ancient Egyptian pastime into one of the longest-standing Olympic sports, having featured in the inaugural modern Games in Athens in 1896. Fencing is one of the longest-standing Olympic sports, having featured in the inaugural modern Games in Athens in 1896 ¹. It has since evolved into a highly technical and physically demanding discipline, with each weapon—sabre, foil, and épée—exhibiting distinct tactical and physiological demands. In épée, the absence of the “priority” rule promotes a more measured style in which athletes exploit opponents’ errors, while the ability to score across the entire body requires longer engagement distances and highly reactive strategies ².

The physical demands of épée fencing are biomechanically complex, ~~involving~~ characterised by rapid accelerations, decelerations, and unilateral loading patterns that place significant stress on the musculoskeletal system. These demands necessitate a nuanced understanding of the physiological and neuromuscular attributes that underpin performance ^{3,4}. Time-motion analyses have shown that bouts involve intermittent high-intensity efforts interspersed with recovery periods, with work-to-rest ratios reported as 1:1 for men’s épée and 2:1 for women’s épée ^{1,5-7}. Despite the intermittent nature of the sport, performance is underpinned by explosive movements such as lunging and rapid changes of direction, which require a combination of strength, power, and neuromuscular coordination ^{8,9}. While biomechanical and physiological studies have extensively examined these attributes, there remains a paucity of research exploring how elite coaches prioritise and interpret these physical qualities in practice ⁴, or how their views align or diverge from established sport science evidence.

Understanding coaches’ perspectives is essential for developing high-performance structures that align with both scientific evidence and practical expertise. Coaches possess experiential knowledge that can inform the design of targeted training programmes, ensuring they are tailored to the specific demands of the sport and the needs of the athlete ^{4,10-12}. Moreover, identifying the physical attributes prioritised by elite coaches may also inform injury prevention strategies, particularly in a sport characterised by asymmetrical loading and repetitive high-intensity movements. By aligning scientific evidence with

coaching priorities, this study offers practical insights for strength and conditioning professionals, physiotherapists, and sport scientists seeking to optimise athlete preparation and reduce injury risk.

To capture expert opinion in areas where empirical evidence is limited, the Delphi method is frequently employed. This structured, iterative process gathers consensus from a panel of experts through multiple rounds of questioning, making it particularly suitable for exploring under-researched topics ¹³. For example, Villiere, Mason, Parmar, Maguire, Holmes, Turner ¹⁴ utilised this approach to identify key physical attributes in Paralympic wheelchair fencing, offering valuable insights into performance determinants in a specialised context.

Accordingly, the aim of this study is to use the Delphi method to reach expert consensus on the physical attributes deemed most important for elite performance in able-bodied international épée fencing, from the perspective of world-class coaches. By aligning or contrasting scientific evidence with coaching priorities, the findings seek to inform evidence-based training strategies that optimise performance and reduce injury risk.

MATERIALS AND METHODS

Experimental Approach to the Problem

This study employed a Delphi methodology, a structured, iterative process used to gather expert consensus on complex or under-researched topics ^{13,15}. The method is well-established in sport science for exploring expert opinion where empirical data may be limited ^{14,16}. A focused Delphi approach was adopted, guided by the frameworks of McCormack, Bird, de Medici, Haddad, Simmonds ¹⁷ and Zambaldi, Beasley & Rushton (2017) ¹⁸. The study was approved by the REMOVED FOR REVIEW Research Ethics Sub-Committee (UK) and conducted in accordance with the Declaration of Helsinki. All participants provided informed consent and were informed of their right to withdraw at any time. Data were anonymised prior to analysis.

Subjects

A purposive sampling strategy was used to recruit international épée coaches with Olympic-level experience. A total of 57 coaches were contacted via industry networks and publicly available contact details. Of these, 35 agreed to participate, and 26 completed at least the first round of the survey and were therefore included in the study. Inclusion criteria required a minimum of five years working in high-performance technical coaching roles and sufficient English proficiency to complete the survey. This sample size exceeds the recommended minimum of 10–15 participants for Delphi studies to ensure validity and representativeness^{19,20}.

Procedure

Although a three-round Delphi process was initially proposed, the study concluded after two rounds. A third round would only be undertaken if Round Two showed material instability in rankings or insufficient panel retention. Rank order changes were monitored across attributes, and disagreements were assessed for whether they were diffuse or polarised. Consensus within Round Two rankings was evaluated using Kendall's coefficient of concordance (W), a non-parametric statistic widely used in Delphi studies to quantify agreement among experts^{21,22}. Within sport science Delphi research, moderate W values (e.g., $W \approx 0.3$) are frequently reported and interpreted as acceptable agreement due to the heterogeneous and subjective nature of coaching perspectives²³. This approach aligns with established Delphi methodology where additional rounds are not required once stability in responses is observed²⁴, and further iterations are unlikely to increase consensus while increasing the risk of attrition bias or panel fatigue^{25,26}.

Round One

Participants completed a web-based survey administered via Qualtrics (Qualtrics, Provo, UT, USA). The survey included seven short-answer demographic questions and one open-ended question asking coaches to identify the physical attributes they prioritise in developing elite épée fencers. The survey was piloted with professional coaches not involved in the main study to ensure clarity. It remained open for 12 weeks, with reminder emails sent at two-week intervals to maximise response rates. Responses

were independently coded by two experienced researchers. Thematic analysis was applied to identify distinct physical attributes and group them into overarching themes.

Round Two

A second web-based survey, administered via SurveyMonkey (SurveyMonkey Inc., San Mateo, CA, USA), presented participants with a consolidated list of physical attributes derived from Round One. To reduce ambiguity, operational definitions of each attribute were provided to ensure clarity of understanding. These definitions were adapted from existing literature but tailored to fencing by incorporating sport-specific terminology and examples. Particular care was taken to distinguish conceptually related constructs; for example, balance was defined as the ability to maintain stability in static or controlled positions, while dynamic stability referred to maintaining postural control during movement, such as advancing, retreating, or recovering from lunges. Operational definitions are summarised in Table 1. Coaches were asked to rank these attributes in order of importance. The same response window and reminder protocol were followed. A third round was deemed unnecessary as rankings were stable, disagreements were either clustered or polarised rather than diffuse, and retention remained sufficient.

Statistical Analysis

A consensus threshold of $\geq 70\%$ agreement was used to determine convergence of opinion, consistent with previous Delphi studies^{14,27}. To judge stability, absolute changes in rank positions between rounds and the spread of rankings for each attribute were examined. A third round was pre specified only if more than one place movement occurred for over 20 percent of attributes or if dispersion remained high after Round Two. Neither condition was met. Data from both rounds were exported to Microsoft Excel (Microsoft Corporation, 2018) for analysis. Descriptive statistics (frequencies and percentages) were used to summarise demographic data and ranking distributions.

Table 1. Demographic information of subjects

Sex	N (%)
Male	23 (88)
Female	3 (12)
Continent	N (%)
Europe	15 (58)
North America	2 (8)
South America	0
Africa	0
Asia	9 (34)
Australia	0
Antarctica	0
Current country coached	N (%)
United Kingdom	2 (8)
Norway	3 (11)
Sweden	3 (11)
Estonia	2 (8)
USA	2 (8)
Israel	3 (11)
Finland	2 (8)
Hong Kong	6 (23)
Germany	1 (4)
France	2 (8)
Years of experience as an international coach	N (%)
6-10	10 (39)
11-15	3 (11)
>15	13 (50)

Qualitative responses from Round One were analysed using Braun, Clarke ²⁸ six-phase thematic analysis framework: familiarisation, coding, theme development, review, definition, and reporting. The research team consisted of a doctoral researcher with a background in fencing and two sport psychology

academics with expertise in qualitative data interpretation and analysis. While the lead researcher's familiarity with *épée* fencing may have shaped interpretation of the data, this was balanced by the involvement of co-researchers less embedded in the sport, supporting reflexivity and reducing interpretive bias. A hierarchical keyword tree was constructed to identify overarching themes and specific attributes (sub-themes), as well as areas of overlap between the outputs of independent analyses. Statistical information was also incorporated, showing the frequency of terminology use and the prevalence of each theme as the percentage of participants who referred to it. The grouping of 23 attributes into nine themes was further informed by established frameworks in elite sport motor control and skill-acquisition frameworks, where agility, coordination, strength, flexibility, and reaction time are recognised as core capacities underpinning high-performance movements²⁹⁻³². This enhanced the credibility of the themes by situating them within existing knowledge. Furthermore, coach perceptions were compared with existing literature on fencing performance to strengthen the interpretation of themes. Key attributes identified in this study, such as lunging ability, change of direction speed, and dynamic stability, are consistently reported as critical determinants of success in elite fencing^{3,33-35}. This convergence highlights the relevance of the themes used. Final themes were reviewed and confirmed by the lead author to ensure coherence and relevance.

RESULTS

Panellist Characteristics

A total of 26 international *épée* coaches completed the first round of the Delphi survey. Panellists represented 11 countries across Europe, North America, and Asia. The majority were male (88%), and 50% had over 15 years of international coaching experience. All panellists met the inclusion criteria of having Olympic-level technical coaching experience and a minimum of five years in high-performance roles. Despite efforts to recruit a geographically diverse panel, representation from South America, Africa, and Oceania was lacking, and the panel was predominantly male. This restricts generalisability and suggests that cultural or regional coaching philosophies, such as differing emphases on physical preparation, tactical styles, or resource-driven training priorities, may have influenced how attributes were valued. A detailed demographic breakdown is provided in Table 2.

Table 2. Keyword Tree of reported physical qualities organised in themes

Theme (Overall percentage)	Sub-Theme (Frequency)	Illustrative Quotes
Aerobic Fitness (12%)	Overall aerobic fitness (7)	<i>"Aerobic fitness helps with decision making and staying sharp late in matches."</i>
	VO2 and muscular endurance (1)	<i>"Endurance (VO2 and muscular) - to be able to achieve high performance during long time"</i>
	Endurance (7)	<i>"Endurance to sustain efforts through the bout and for the day (multiple days)"</i>
	Stamina (3)	<i>"stay in top physical form as long as required"</i>
Agility (38%)	Overall agility (10)	<i>"Agility for a better ability to change of direction"</i>
	Efficiency of movement (1)	<i>"Technique for the efficiency of the movements"</i>
Balance/co-ordination (54%)	Overall balance/co-ordination (14)	<i>"Maintaining control in extended lunges without falling off balance."</i>
	Co-ordination of body parts (1)	<i>"coordination - to be able to perform the movements in the predetermined order"</i>
	Accuracy (1)	<i>"Precise blade placement even under fatigue."</i>
Dynamic Stability (19%)	Overall stability (5)	<i>"General core strength: in order for the athlete to be stable while he is moving"</i>
	Keep body stable (1)	<i>"Keeping the body stable while attacking or defending is crucial."</i>
	Mobility (1)	<i>"mobility is essential in fencing"</i>
Flexibility (46%)	Overall flexibility (12)	<i>"Flexibility to better reach the low lines and adapt during attacks."</i>
	Suppleness (1)	<i>"Supple movement ensures efficiency and reduced injury risk."</i>
Power (19%)	Explosivity (3)	<i>"explosivity - better explosivity gives ability to execute attack faster"</i>
	Explosive muscle power (2)	<i>"Explosive muscle power to launch specific fencing actions with speed and impact."</i>
Reaction Time (4%)	Overall reaction time (2)	<i>"enabling to react fast to opponent actions"</i>
	Speed of reaction (1)	<i>"Reaction speed is vital to respond immediately to opponent's changes."</i>
Speed/Acceleration (27%)	Acceleration (7)	<i>"Acceleration- each attack should have proper acceleration as slower beginning can not be a signal for the opponent"</i>
	Hand speed (4)	<i>"Hand/arm speed - as counter attack is very effective action in epee, ability to work fast with arm is big advantage during the fencing match"</i>
	Leg speed (5)	<i>"Speed in the legs allows faster attacks and retreats."</i>
	Change of speed (1)	<i>"To be less expected and more effective in the attack"</i>
Strength (19%)	Overall strength (8)	<i>"Physically- you need to be strong"</i>

Round One: Attribute Identification

In the first round, coaches responded to an open-ended question regarding the physical attributes they prioritise in developing elite épée fencers. Table 2 details a keyword tree of key themes, sub-themes and example quotes from the participants. The number of coaches that highlighted an attribute are expressed as a percentage of the total participant group, with the frequency of each sub-theme also presented. Thematic analysis of responses identified 23 distinct physical attributes, which were grouped into nine overarching themes: agility, reaction time, speed/acceleration, strength, power, aerobic fitness, flexibility, balance/coordination, and dynamic stability. The most frequently cited themes identified by coaches were balance/coordination (54%), flexibility (46%), and agility (38%).

Table 3: Operational definitions of Physical Attributes

Physical Attribute	Operational Definition	Reference Points
Agility	<i>To rapidly change body position, for example from advance to retreat.</i>	Sheppard, Young ⁴⁸ , Thurlow, Huynh, Townshend, McLaren, James, Taylor, Weston, Weakley ⁴⁹
Reaction time	<i>The time taken for a fencer to respond to a stimulus</i>	Borysiuk, Konieczny, Błaszczyszyn, Błach, Obmiński ⁵⁰ , Di Martino, Giommoni, Esposito, Alessandro, Della Valle, Iuliano, Fiorilli, Calcagno, di Cagno ⁵¹
Speed/ Acceleration	<i>How quickly the fencer moves.</i>	Varesco, Sarcher, Doron, Jubeau ⁵²
Balance	<i>The ability of an individual to control either static or dynamic equilibrium while maintaining a stable position.</i>	Alkhamis, Reddy, Alahmari, Alshahrani, Koura, Ali, Mukherjee, Elrefaey ⁵³ , Lesch, Tuomisto, Tikkanen, Venojärvi ⁵⁴
Dynamic Stability	<i>Describes the body's resistance to being moved out of the present state of motion.</i>	Frost, Cronin, Newton ⁵⁵ , Lockie, Schultz, Callaghan, Jeffriess ⁵⁶
Power	<i>The ability to exert large amounts of force quickly.</i>	Suchomel, Nimphius, Stone ⁵⁷ , Turner, Comfort, McMahon, Bishop, Chavda, Read, Mundy, Lake ⁵⁸
Aerobic Fitness	<i>The ability to deliver oxygen to the muscles and to utilise it to generate energy to support muscle activity during exercise.</i>	Armstrong, Tomkinson, Ekelund ⁵⁹ , Cardinale, Newton, Nosaka ⁶⁰
Flexibility	<i>Use the full range of movement available at a joint.</i>	Pate, Oria, Pillsbury, Committee on Fitness Measures and Health Outcomes in

Youth ⁶¹, Favro, Roma, Gobbo, Bullo, Di Blasio, Cugusi, Bergamin ⁶²

Strength

The capacity to generate large amounts of force.

Suchomel, Nimphius, Stone ⁵⁷, Turner, Comfort, McMahon, Bishop, Chavda, Read, Mundy, Lake ⁵⁸

Round Two: Attribute Ranking

To ensure clarity of the attributes, operational definitions of each attribute were provided to coaches at the start of the questionnaire and throughout. See table 3 for operational definitions. Twenty-one coaches (81% of Round One participants) completed the second-round survey, meeting the $\geq 70\%$ retention threshold commonly recommended for Delphi reliability. Participants were asked to rank the nine identified physical attributes in order of importance. Rankings were analysed using a weighted average system. Agility was ranked as the most important attribute (mean = 2.90), followed by reaction time (3.33) and speed/acceleration (4.10). Strength received the lowest priority (7.57), despite its foundational role in supporting other performance traits. The full ranking results are presented in Table 4. Consensus across Round Two rankings was assessed using Kendall's coefficient of concordance ($W = 0.26$), reflecting acceptable agreement typical of heterogeneous expert panels in sport science Delphi research. While opinions diverged, disagreements were polarised rather than unstable, suggesting that further rounds were unlikely to change the rank order substantially.

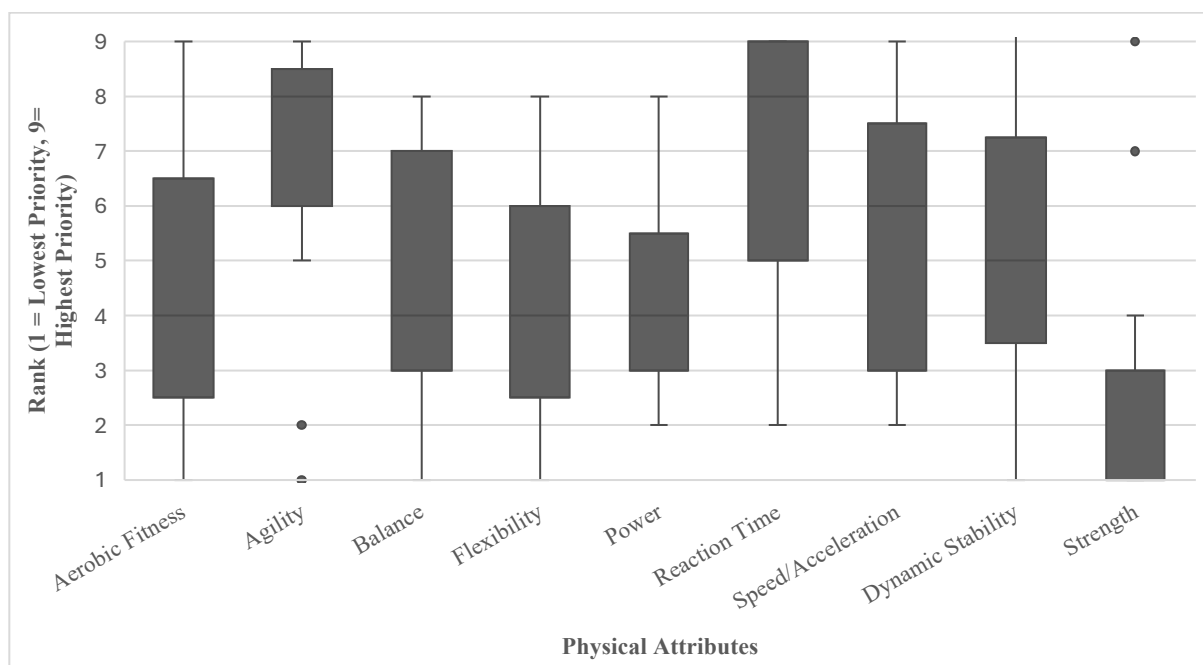
Table 4: Rank Order of Physical Qualities in Round Two of the Delphi Process.

Physical Attribute	Rank	Weighted Ave
Agility	1	2.9
Reaction time	2	3.33
Speed/Acceleration	3	4.1
Balance	4	4.81
Dynamic Stability	5	5.43
Power	6	5.33
Aerobic Fitness	7	5.67
Flexibility	8	5.86
Strength	9	7.57

Consensus & Polarisation of Rankings

Analysis linking coaches' Round One nominations to Round Two rankings revealed three distinct patterns of agreement (Figure 1). First, some attributes demonstrated high-ranked consensus: agility and reaction time were frequently nominated in Round One and consistently ranked near the top in Round Two, reflecting strong alignment on their importance for épée performance. Second, certain attributes displayed low-ranked consensus: both strength and power showed relatively narrow distributions clustered toward the bottom of the rankings, indicating agreement that they were of lower relative priority. Finally, polarised attributes included aerobic fitness and flexibility, which exhibited wide distributions across the ranking scale. Some coaches who nominated these qualities in Round One ranked them highly in Round Two, while others consistently placed them among the lowest priorities. This divergence reflects entrenched philosophical differences rather than random variability. These combined patterns are consistent with the acceptable Kendall's W observed in Round Two and indicate that disagreement was stable rather than unstable. Accordingly, further Delphi rounds were unlikely to reconcile these opposing views and instead risked panel fatigue without altering the overall rank order.

Figure 1. Polarisation & Clustering in Round Two Rankings



Boxplot showing the distribution of coach rankings (1 = lowest priority, 9 = highest priority) for each physical attribute in Round Two. Wider spreads (e.g., for aerobic fitness and flexibility) indicate polarisation, whereas tighter clustering (e.g., for agility and strength) reflects stronger consensus.

Summary of Key Findings

The Delphi process revealed a strong consensus consensus-high prioritisation among elite coaches for agility and reaction time that agility, reaction time, and speed/acceleration are the most critical physical attributes for high-level épée performance. Conversely, attributes such as strength, aerobic fitness, and flexibility were consistently ranked lower, suggesting a potential disconnect between coaching priorities and established sport science literature. These findings provide a valuable foundation for aligning physical preparation strategies with both empirical evidence and expert coaching insight.

The Delphi process revealed consensus-high prioritisation among elite coaches for agility and reaction time, which were consistently ranked as the most critical physical attributes for high-level épée performance. Attributes such as strength and power showed consensus-low rankings, indicating agreement that they were of lower relative priority despite their recognised foundational role. In contrast, aerobic fitness and flexibility demonstrated polarised distributions, with some coaches ranking them highly and others placing them among the lowest priorities. This pattern was reflected in Kendall's coefficient of concordance ($W = 0.26$), which indicated acceptable agreement typical of heterogeneous expert panels in sport science. These findings highlight both areas of alignment and entrenched philosophical differences within elite coaching practice, providing a foundation for aligning physical preparation strategies with empirical evidence while also recognising the diversity of expert opinion.

DISCUSSION

This Delphi study is the first to systematically capture and rank the physical attributes prioritised by elite-level épée coaches. The findings reveal a consensus-high prioritisation of agility and reaction time, which were consistently ranked as the most critical physical qualities for high-level performance. These results align with existing biomechanical and time-motion analyses of fencing, which highlight the centrality of rapid directional changes, explosive lunges, and quick responses to stimuli^{1,3,36}. Speed/acceleration was also valued, reinforcing its importance in executing attacks and counterattacks under time pressure.

Key Attribute Analysis

Agility's prominence, reflects the dynamic and reactive nature of épée fencing, where the ability to change direction at speed is crucial for both attack and defence. This is consistent with previous research showing that change-of-direction ability is a key determinant of success, and is underpinned by lower-limb power and neuromuscular coordination^{35,37}. Similarly, reaction time, has been consistently shown to differentiate between elite and sub-elite fencers³⁸. Together, these attributes represent the 'visible' performance outcomes that coaches readily identify and value.

However, this prioritisation contrasts with the consistently low rankings for strength and power. These attributes are well-established in sport science as the foundations of agility, speed, and injury resilience^{3,33}. Strength contributes to explosive force production, movement efficiency, and deceleration control, while power enables rapid lunge execution. The undervaluation of aerobic fitness was also striking, given evidence that fencing's physiological demands extend beyond single bouts. Direct elimination matches are characterised by heart rates of 75–100% HRmax and ~75% $\dot{V}O_2$ max, with recovery between bouts critical for sustaining performance across a full competition day³⁹. This gap between scientific evidence and coaching priorities highlights a need for improved knowledge translation. Coaches may value the end products of agility and speed without fully recognising the physiological and neuromuscular capacities that underpin them.

Despite this alignment, the study also revealed a notable disconnect between coaching priorities and established sport science principles. Strength and aerobic fitness were ranked lowest, despite their foundational role in supporting agility, speed, and recovery. This underappreciation of strength is particularly concerning given its well-documented contribution to explosive power, movement efficiency, and injury prevention^{40,41}. Similarly, while aerobic capacity may not directly influence short bursts of activity, it plays a critical role in recovery between bouts and sustaining performance across a full competition day^{42,43}.

This disconnect may reflect a gap in knowledge translation between scientific research and applied coaching practice. Coaches may observe and value the outcomes of agility and speed without fully recognising the physiological mechanisms that underpin them. This highlights the need for enhanced interdisciplinary collaboration and targeted

coach education to bridge this gap. Strength and conditioning professionals, physiologists, and biomechanists can play a key role in helping coaches understand how foundational attributes like strength and energy system development contribute to the qualities they prioritise.

Injury Prevention

The undervaluation of strength and dynamic stability also has important implications for injury risk. Fencing is characterised by asymmetrical loading, high-impact lunges, and rapid decelerations—all of which impose considerable stress on the lower extremities and elevate injury risk ^{44,45}. Recent reviews show that over 70% of injuries in fencing affect the knee, ankle, and hip, with patellofemoral pain and chronic tendinopathy among the most common conditions ⁴⁴. Studies of elite U.S. national team members and Olympians confirm that knee and hip injuries are highly prevalent and often performance-limiting ⁴⁶. Biomechanical analyses further link fencing's repetitive lunges and asymmetrical movement patterns to high musculoskeletal loading ⁴⁵. Deficits in strength and neuromuscular stability amplify these risks. Therefore, a more balanced emphasis on foundational physical qualities, particularly strength, power, and dynamic stability, should enhance performance but also protect long-term athlete health and career longevity.

In addition to performance enhancement, the undervaluation of strength and dynamic stability may have implications for injury risk. Fencing is characterised by asymmetrical loading, high-impact lunges, and rapid decelerations, all of which place considerable stress on the musculoskeletal system. Deficits in strength and neuromuscular control have been associated with increased injury risk in similar sports ⁴⁷. Therefore, a more balanced emphasis on foundational physical qualities may not only improve performance but also support long-term athlete health and resilience.

Practical Applications

Coach education: The disconnect between coaching priorities and foundational attributes suggests a need for targeted coach education. Interdisciplinary workshops and seminars, delivered jointly by fencing coaches, sport scientists, and strength and conditioning specialists, could explicitly link agility and speed outcomes to their underlying physical determinants. Practical demonstrations (e.g., how hip extensor strength enhances lunge velocity or how aerobic fitness improves bout-to-bout recovery) may make these connections more salient to coaches.

Training program design: The findings can inform the design of fencing-specific physical preparation. Tactical drills can continue to emphasise agility, reaction time, and speed, while dedicated support blocks should target strength and aerobic conditioning. Periodised integration of these attributes, such as coupling COD drills with lower-limb strength training, or including high-intensity conditioning between fencing sessions, can better align training with both empirical evidence and performance needs.

Injury prevention: Given the asymmetrical and high-impact demands of fencing, undervaluing strength and dynamic stability may elevate injury risk. Incorporating structured strength and stability training, particularly targeting the hip, knee, and trunk unilaterally, could reduce the prevalence of chronic overuse injuries while supporting optimal performance. Injury-prevention strategies should be framed not only as health protection but also as essential to sustaining performance across long competition calendars.

Future Research

Future studies should examine how targeted interventions in strength, power, and aerobic conditioning influence agility, reaction time, and speed in fencing populations. Longitudinal research could also assess how coach perceptions shift following exposure to evidence-based education and interdisciplinary support. Expanding Delphi panels to include more geographically diverse and gender-balanced coaches will improve generalisability of the current research and may reveal cultural differences in attribute prioritisation.

The findings also suggest opportunities for future research. Longitudinal studies could examine how targeted interventions in strength, power, and energy system development influence agility, speed, and reaction time in fencing populations. Additionally, exploring how coaches' perceptions evolve following exposure to sport science education could inform the design of more effective interdisciplinary support models.

LIMITATIONS

Several limitations should be acknowledged. First, although consensus was reached after two rounds, the absence of a third round may have marginally refined the rank order; however, Round Two results demonstrated acceptable agreement and stable but polarised differences, making further convergence unlikely. Second, the panel was predominantly male and drawn from Europe, North America, and Asia, with no representation from South America, Africa, or Oceania. This restricts global generalisability and raises the possibility that cultural or regional coaching philosophies may shape perceptions of physical priorities. Third, while operational definitions were provided, conceptual overlap between constructs such as balance and dynamic stability cannot be entirely eliminated, and different interpretations may have influenced rankings. Fourth, the panel size (n=26 in Round One, n=21 in Round Two) exceeds methodological recommendations for Delphi studies but remains modest compared with the global coaching population. Finally, anonymity was maintained across rounds, but this precluded exploration of how individual philosophies shifted in response to group feedback, which could have added depth to the analysis.

CONCLUSION

This study provides novel insight into the physical attributes prioritised by elite épée coaches. Agility and reaction time emerged as consensus-high priorities, while strength and power were consistently devalued and aerobic fitness and flexibility showed polarised opinions. These patterns align with observed performance demands but diverge from established sport science evidence, underscoring the need for stronger integration of foundational strength, conditioning, and stability work. Bridging this gap through interdisciplinary collaboration and targeted coach education could enhance both performance outcomes and injury prevention. While these findings offer a valuable foundation for refining physical preparation strategies in fencing and combat sports, future research should expand panel diversity and examine how coach perceptions evolve with structured exposure to sport science. These findings offer a foundation for refining physical preparation strategies in fencing and may inform broader approaches to athlete development in combat sports.

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