Advances in Nonlinear Variational Inequalities
ISSN: 1092-910X
Vol 28 No. 7s (2025)

Enhancing Performance In Women's Badminton: Interplay Of Coaching, Facilities, Technology, And Cultural Support In Guangxi

Jiancong Yang[1] ， Juliet A. Demalen[1*]

[1]**Master**,Trinity University of Asia College of Education, Philippines， 1008

[1*] Dr, Trinity University of Asia College of Education, Philippines， 1008

First Author Email:jiancongnyang@tua.edu.ph

Corresponding Author Email: jademalen@tua.edu.ph

Article History:

Received: *10-01-2025*

Revised: *27-02-2025*

Accepted: *07-03-2025*

ABSTRACT

This study examines the factors influencing the performance of elite women's singles badminton players at Guangxi University for Nationalities, focusing on the player-coach relationship, training facilities, interactions between players and coaches, technology integration, and cultural influences. Using a descriptive-correlational design, data were collected from 80 participants, and the relationships between these factors and performance were analyzed. Results show significant relationships between training facilities, interactions with coaches, and technology integration in training with performance, emphasizing the importance of well-maintained facilities, positive player-coach interactions, and advanced technological tools in enhancing player performance. However, the study found no significant direct impact from the player-coach relationship and cultural influences on performance. The results highlight the importance of a well-rounded training program that includes these components to enhance the performance of top athletes. The research provides practical guidance for creating more impactful training approaches for badminton athletes in comparable organizations.

Keywords: *Badminton performance, training facilities, player-coach relationship, technology integration, cultural influences.*

INTRODUCTION

Badminton is very exciting sport and also competitive. It need quick reflexes, skill, and smart thinking to play good. In recent years, technology like video analysis and physical feedback change how sports train and how performance improve, include badminton (Smith & Lee, 2021). Top athlete do best in place where have great training facility, encourage good relationship between player and teacher, and have cutting-edge technology and culture that support their physical growth (Brown & Johnson, 2020).

But, new studies show very important to learn more about how these factors change over time and how they affect player success, especially for women's singles badminton players (Johnson & Chen, 2019). This research look at how player-coach relationship, training place quality, player-coach talk, technology use, and culture factor all connect to elite women badminton player performance at Guangxi University for Nationalities. The results are made to give useful help for improving the school's training programs and making the athletes grow better overall.

This research talk about important thing how these factors make elite performance in badminton, especially in sports at Chinese universities.

METHOD

Research Design

This research use descriptive-correlational design to look at connection between many factors—player-coach dynamic, training facility, interaction between player and coach, technology use, and culture influence—and performance of elite women's singles badminton player at Guangxi University for Nationalities. Data collection was carried out with a well-established and dependable questionnaire that underwent pilot testing, resulting in a Cronbach's Alpha reliability score of 0.840. The analysis of the survey responses involved employing Pearson's correlation and one-way ANOVA to uncover meaningful relationships and distinctions in how players evaluated their environment and performance results. Microsoft Excel and Jamovi software were used for statistical analysis.

Participants

The participants of this study were 80 elite women's singles badminton players from Guangxi University for Nationalities, aged 18 to 20 years old. The sample was selected using purposive sampling, targeting players actively participating in badminton training and competitions during the 2022-2023 academic year. The majority of respondents had 0-2 years of badminton training experience, with smaller groups having 3-5 years and 6 years or more of experience. All participants voluntarily completed a questionnaire assessing their perceptions of the player-coach relationship, training facilities, interactions, technology integration, and cultural influences in sports.

Instrumentation

The primary data collection instrument was a researcher-developed questionnaire designed to assess the dynamic interaction between individual players and their environment in elite women's singles badminton. The questionnaire covered five key areas: player-coach relationship, training facilities, interactions between players and coaches, technology integration in training, and cultural influences in sports. The questionnaire was validated by four badminton experts, whose feedback was incorporated into the final version. A pilot test was conducted on 10 badminton players, and the instrument's reliability was confirmed using Cronbach's alpha, with overall scale reliability of 0.840. Reliability scores for each area ranged from 0.719 to 0.980, indicating strong internal consistency. Data were collected through self-administered questionnaires completed by the participants.

Data Gathering Procedure

A researcher-developed questionnaire represented the data collection method to assess elite women's singles badminton players at Guangxi University for Nationalities. School administrators approved the questionnaire distribution through combination methods of email and WeChat platforms to reach the participants. Players received information about the study reason before signing consent to proceed with the questionnaire administration. Research participants completed the questionnaire between two weeks that the team compiled in Microsoft Excel for preliminary arrangement. The relationships between players' environmental contacts and their performance were analyzed through statistical methods in Jamovi software using descriptive statistics and correlation techniques. The gathered data enabled system researchers to develop improvements for the training protocol.

Data Analysis

The processed data entailed Microsoft Excel data entry and organization before the statistical analysis was conducted in Jamovi. The study used descriptive statistics to present information about the survey participants and how they evaluated the connection between individual characteristics and environmental conditions. A Pearson correlation analysis measured the relationships between different variables including player-coach relationships along with training facilities and performance outcomes. The study achieved strong reliability based on Cronbach's Alpha scores between 0.719 and 0.980 (Taber, 2019). Results from these assessments helped discover weak points for improvement and determined changes for the proposed training program.

RESULTS

The research outcomes pertaining to individual-environment relationships and their impact on Guangxi China's elite women's singles badminton player performance are explained in this section. The research data underwent evaluation to understand player-coach relationships together with training facilities and interactions and technological integration and cultural elements.

Table 1: ***Mean Score, Standard Deviation and Descriptive Interpretation on the Assessment of the Respondents in terms of Player – Coach Relationship***

Statements **The player and the coach…**	**Mean Score**	**Interpretation**	**SD**
1. have a clear long-term and short-term goals and both work hard toward accomplishing the goals.	4.95	Excellent	0.22
2. are aware of their responsibilities towards accomplishing the goals.	4.78	Excellent	0.48
3. demonstrate high values discipline before, during and after training sessions.	4.49	Excellent	0.58
4. constantly cultivate the culture of trust and confidence in their partnership.	4.16	Very Good	0.94
5. are aware that developing the whole person of the player will lead to optimal performance.	4.27	Excellent	0.85
6. actions reinforce the development of a sense of open and honest relationship in the partnership.	4.38	Excellent	0.69
7. objectively discuss the feedback that helped the player understand her strengths and weaknesses relative to the course's goals and objectives.	4.45	Excellent	0.79
Overall Rating	**4.50**	**Excellent**	**0.26**

Legend:

Scale	**Rating Scale**	**Descriptive Interpretation**
1	1.00-1.80	Strong Disagree/ Poor
2	1.81-2.60	Disagree/Fair
3	2.61-3.40	Neutral/Good
4	3.41-4.20	Agree/ Very Good
5	4.21-5.00	Strongly Agree/Excellent

The assessment of the player-coach relationship appears in Table 1. The ratings data showed "excellent" relationships between athletes and coaches while the mean score reached 4.50 which suggests strong athlete-coach bond value. The statement about players and coaches working together on defined objectives received the highest mean score of 4.95 indicating their essential connection. Responents rated the statement "The player and the coach constantly cultivate trust and confidence" with a score of 4.16 which indicates trust is valued but confidence development needs improvement in this relationship.

The analysis in the table examines the connection between physical training environments and player performance.

Table 2: ***Mean Score, Standard Deviation and Descriptive Interpretation on the Assessment of the Respondents in terms of Training Facilities***

Statements	**Mean Score**	**Interpretation**	**SD**

1.The school has enough number of badminton courts that can accommodate the training sessions as scheduled.	4.51	Excellent	0.69
2. The badminton courts are regularly maintained to ensure that lighting and ventilation are good.	4.44	Excellent	0.76
3. The badminton courts are regularly manned with personnel to ensure that training are sessions are done without unnecessary delays.	4.34	Excellent	0.93
4. The badminton courts have the necessary supply such posts, nets, rackets, and shuttlecocks.	4.43	Excellent	0.8
5. The badminton courts have digital score boards.	4.41	Excellent	0.87
6.The badminton courts are equipped with CTTVs for security purposes.	4.44	Excellent	0.93
7.The school follows the standards for the upkeep of the badminton courts, facilities, and equipment.	4.51	Excellent	0.9
Overall Rating	**4.44**	**Excellent**	**0.34**

Legend:

Scale	**Rating Scale**	**Descriptive Interpretation**
1	1.00-1.80	Strong Disagree/Poor
2	1.81-2.60	Disagree/fair
3	2.61-3.40	Neutral/ Good
4	3.41-4.20	Agree/Very Good
5	4.21-5.00	Strongly Agree/Excellent

The assessment of facilities received excellent grades from respondents according to the data in Table 2 along with an overall mean score of 4.44. The survey results showed respondents gave the highest score of 4.51 to the adequacy of badminton courts indicating courts' importance for effective training. The evaluation of training session management scored 4.34 as the lowest marks demonstrated a requirement for improved monitoring and supervision practices during practice sessions. The following table explores how players and coaches dynamically engage with each other after going beyond facility analysis.

Table 3: ***Mean Score, Standard Deviation and Descriptive Interpretation on the Assessment of the Respondents in terms of Interactions between Players and Coaches***

Statements	**Mean Score**	**Interpretation**	**SD**
1. The player and the coach create the game goals together.	4.72	Excellent	0.45
2. The training sessions are video recorded which are used as vital reference in their game plans.	4.49	Excellent	0.73
3. The player and the coach both pay attention to their body languages during training sessions.	4.49	Excellent	0.86
4. The player and the coach maintain an engaging and productive dialogs.	4.52	Excellent	0.8

5. The player and the coach maintain an honest but encouraging comments for each other.	4.61	Excellent	0.82
6. The coach clearly communicates important due dates/time frames for the different training tasks and activities.	4.45	Excellent	0.71
7. The players and the coach maintain a strictly professional relationship.	4.33	Excellent	0.93
Overall Rating	**4.51**	**Excellent**	**0.41**

Legend:

Scale	Rating Scale	Descriptive Interpretation
1	1.00-1.80	Strong Disagree/Poor
2	1.81-2.60	Disagree/Fair
3	2.61-3.40	Neutral/Good
4	3.41-4.20	Agree/ Very Good
5	4.21-5.00	Strongly Agree/Excellent

Results from Table 3 indicate "Excellent" evaluations of player-coach interactions with average ratings coming in at 4.51. Respondents rated the statement about cooperative game goal setting at 4.72 points which scored highest among all statements. Survey participants gave a score of 4.33 to statements regarding professional relationship maintenance which indicates different levels of formality exists between professionals despite the need for professionalism. To assess how technological advancements contribute to training, the following table explores technology integration.

Table 4: ***Mean Score, Standard Deviation and Descriptive Interpretation on the Assessment of the Respondents in terms of Technology Integration in the Training***

Statements	Mean Score	Interpretation	SD
1.The players and the coach regularly attend seminars on emerging technology integration in trainings.	4.61	Excellent	0.85
2.The coach integrate technology in badminton training such as the use of virtual reality simulations to enhance decision-making and perceptual skills in badminton players.	4.61	Excellent	0.85
3.The coach investigates the impact of real-time feedback through wearable sensors on player movement and shot accuracy.	4.67	Excellent	0.55
4. Data collected from the technology is used in identifying areas for improvement of the players.	4.50	Excellent	0.81
5. The players and coach follow the manual of instructions of the related technology integration programs and applications in the training.	4.50	Excellent	0.86
6. The coach is helpful in guiding the players towards understanding the integration of technology in a way that is helpful to the players.	4.53	Excellent	0.83

7.The player and coach take advantage of the utility of data analytics in tailoring training regimens to individual player profiles.	4.64	Excellent	0.62
Overall Rating	**4.58**	**Excellent**	**0.35**

Legend:

Scale	Rating Scale	Descriptive Interpretation
1	1.00-1.80	Strong Disagree/Poor
2	1.81-2.60	Disagree/Fair
3	2.61-3.40	Neutral/Good
4	3.41-4.20	Agree/Very Good
5	4.21-5.00	Strongly Agree/Excellent

The rating for Table 4 underscored "Excellent" performance with participants giving it a mean score of 4.58. Results show real-time feedback enabled through wearable sensors achieved the highest response mean score of 4.67 thus proving advanced technology improves performance effectiveness. Training staff need to focus more attention on following technology usage guidelines because the lowest score came out to 4.50.

Sports performance shows varied effects according to cultural aspects as presented in this table.

Table 5: ***Mean Score, Standard Deviation and Descriptive Interpretation on the Assessment of the Respondents in terms of Cultural Influences in Sports***

Statements	Mean Score	Interpretation	SD
1.The local media, newspaper, radio and TV stations have sport segments in their broadcasts.	4.63	Excellent	0.68
2. The social media presence is strong in promoting the badminton related activities of the school.	4.66	Excellent	0.64
3. There are community volunteers during badminton competitions held in the school.	4.66	Excellent	0.75
4. The social community supports the badminton training of the students.	4.55	Excellent	0.68
5. The badminton clubs and clinics are well supported with the community leaders and the youth.	4.59	Excellent	0.78
6.The school administrators are very supportive with the different badminton related activities of the schools.	4.64	Excellent	0.66
7.There are generous donors in the community that donate monetary supports for the improvement of training facilities of the school.	4.61	Excellent	0.56
Overall Rating	**4.62**	**Excellent**	**0.28**

Legend:

Scale	Rating Scale	Descriptive Interpretation

1	1.00-1.80	Strong Disagree/Poor
2	1.81-2.60	Disagree/Fair
3	2.61-3.40	Neutral / Good
4	3.41-4.20	Agree/Very Good
5	4.21-5.00	Strongly Agree/ Excellent

`Table 5 shows an "Excellent" overall rating of 4.62. Evaluation results indicated that the promotion of badminton activities on social media and community involvement during competitions scored 4.66 as the most excellent aspect of the program. Community support for badminton training stands at 4.55 on the scale indicating a need for enhancement regarding cultural engagement in this area.

The investigation of age-related variation in data appears in the following table which splits responses by age groups.

Table 6: ***Test of Significant difference in the Assessment of the Respondents on the interaction of the individual and the environment in the areas covered when Age is used as a test factor***

One-Way ANOVA

	F	**df1**	**df2**	**p**
Player and coach relationship	2.263	2	22.5	0.127
Training Facilities	0.748	2	23.1	0.484
Interactions between Players and Coaches	0.858	2	25.3	0.436
Technology Integration in the Training	3.546	2	40.7	0.038
Cultural Influences in Sports	0.483	2	21.0	0.624

Note: Significant at p <.05

Table 6 shows no significant differences across most areas, except for technology integration, where younger respondents were more receptive to technological tools. This indicates a generational difference in technology adoption within the training environment.

Moving to the next factor, the following table assesses how the number of years of training affects the respondents' perceptions.

Table 7: ***Test of Significant difference in the Assessment of the Respondents on the interaction of the individual and the environment in the areas covered when Years of Training is used as a test factor***

One-Way ANOVA (Welch's)

	F	df1	df2	p
Player and coach relationship	0.0119	2	6.52	0.988
Training Facilities	0.0314	2	6.51	0.969
Interactions between Players and Coaches	1.3482	2	8.05	0.313
Technology Integration in the Training	0.2778	2	6.40	0.766
Cultural Influences in Sports	2.4132	2	7.31	0.157

Note: Not Significant at p >.05

Table 7 shows that there were no significant differences in the assessment based on the number of years of training. This suggests that perceptions of the environment, training conditions, and interpersonal relationships are relatively consistent regardless of the number of years the athletes have trained.

Next, the performance of respondents is analyzed based on age, as shown in the following table.

Table 8: ***Badminton performance of the respondents in SY 2022-2023 in terms of Age***

Group Descriptives

	Age	N	Mean	SD	Interpretation
Performance	18	8	4.62	0.0629	Excellent
	19	34	4.55	0.1201	Excellent
	20	38	4.49	0.1874	Excellent

Legend:

Scale	Rating Scale	Descriptive Interpretation
1	1.00-1.80	Very Poor
2	1.81-2.60	Poor
3	2.61-3.40	Average
4	3.41-4.20	Good
5	4.21-5.00	Excellent

Table 8 shows that respondents from all age groups rated their performance as "Excellent," demonstrating consistently high performance levels across all age categories.

The following table provides an analysis of the performance of respondents based on their years of training.

Table 9: ***Badminton performance of the respondents in SY 2022-2023 in terms of Years of Training***

Group Descriptives

	Years of badminton training:	N	Mean	SD	Interpretation
Performance	0-2	66	4.53	0.154	Excellent
	3-5	10	4.52	0.173	Excellent
	6 years and above	4	4.57	0.191	Excellent

Legend:

Scale	Rating Scale	Descriptive Interpretation
1	1.00-1.80	Very Poor
2	1.81-2.60	Poor
3	2.61-3.40	Average
4	3.41-4.20	Good
5	4.21-5.00	Excellent

Table 9 shows that respondents with varying years of training rated their performance as "Excellent," indicating that high performance is consistently achieved regardless of the athletes' training duration.

Finally, the last table explores the significant relationships between key environmental factors and badminton performance.

Table 10: ***Test of Significant relationship in the assessment of the respondents on the interaction of the individual and the environment in the areas covered and their badminton performance***

Variables	Pearson's r	p-value	Decision	Conclusion
Player and coach relationship	**0.20**	0.074	Accept Ho	Not Significant
Training Facilities	0.49	< .001	Reject Ho	Significant
Interactions between Players and Coaches	**0.76**	< .001	Reject Ho	Significant
Technology Integration in the Training	0.58	< .001	Reject Ho	Significant
Cultural Influences in Sports	**0.20**	0.075	Accept Ho	Not Significant

Significant correlations between player-coach interactions, training facilities, badminton performance, and technology integration are shown in Table 10. However, no significant correlations were discovered for player-coach relationships or cultural influences, indicating that these factors may not have a direct impact on performance in this specific context.

The findings clearly highlight the significance of strong player-coach relationships, effective technology integration, and top-notch training facilities in nurturing exceptional badminton players. Although the connections between players and coaches, along with cultural backing, were greatly appreciated, their direct impact on performance was somewhat limited. These results clearly show that to enhance players' performance, a thorough and well-supported training environment is essential.

DISCUSSION

This study reveals the crucial impact of multiple factors on the performance of elite women's singles badminton players at Guangxi University for Nationalities. The impact of training facilities, player-coach interactions, and the integration of technology has proven to be substantial, revealing strong connections to performance outcomes. The findings match previous studies stressing the need of excellent training environments and the incorporation of technology to improve athletic performance (Smith & Lee, 2021; Brown & Johnson, 2020). Wearable sensors and video analysis's real-time input has shown players' decision-making and accuracy improvements (Williams & Chen, 2021). Unlike previous studies showing that strong player-coach connections are necessary for attaining athletic success, the study demonstrated no clear correlation between the relationship and performance (Johnson & Chen, 2019). Furthermore, while the respondents valued cultural influences, these variables did not directly impact performance, suggesting that in competitive surroundings training-related elements are more crucial. These realizations provide the foundation for refining training courses to stress important components enhancing performance.

CONCLUSIONS

This study explored the changing dynamics between individual and environmental factors that influence the performance of elite female badminton athletes at Guangxi University for Nationalities. The results very clear show that training place quality, player and coach talk, and using technology are very important for making player performance better. Good court very nice, and use new technology like sensors on body, also coach and player talk good, all these very important for best performance. Even the people who answer say player-coach relationship and cultural support is very important, but these things no show clear link to how well they perform. This maybe show that these things very important for good training place, but they no mean right away better performance. The study show important to make good training place with technology and support to help player do better. For future badminton training program, it is good to put money in new training technology, make training place better, and make sure player and coach talk about tactic and performance things. This big way will probably make sports performance better in same university sports situation.

IMPLICATIONS

This study find many important things for make training program for very good badminton players. First, training facility very important. Institutions should make sure to keep courts and equipment good and upgrade them often for best player performance. Second, technology in training is very important—like real-time feedback tools and video analysis—should be more bigger to make sure players get clear, useful advice when they practice. Last thing, player-coach relationship and culture influence no show direct impact on performance, but these factors should not ignore, because they help make good and motivate training environment. Coaches need to make sure they look at both how to talk to players and also how to help them play better. They should give both support for feelings and also good tips for game. Institutions should also keep promoting culture and community support for make better morale and engagement overall.

REFERENCES

1. Brown, J., & Johnson, L. (2020). The impact of systematic training programs on athletic performance. *Journal of Sports Science and Coaching*, *15*(3), 235-248. https://doi.org/10.1177/1747954120903187

2. Brown, T., & Lee, M. (2021). The effects of training environment and duration on athletic performance in young athletes. *International Journal of Sports Science and Coaching*, *16*(2), 95-108. https://doi.org/10.1177/1747954121994142
3. Johnson, R., & Chen, L. (2019). Exploring the player-coach relationship in elite sports settings. *International Journal of Sports Psychology*, *54*(1), 45-58. https://doi.org/10.1123/ijspp.2019-0421
4. Johnson, S., & Lee, W. (2020). Interactions between players and coaches: A critical factor in athlete development. *Journal of Sport and Exercise Psychology*, *42*(5), 120-133. https://doi.org/10.1123/jsep.2020-0197
5. Smith, A., & Brown, J. (2020). The importance of training facilities in sports performance: A review. *Journal of Physical Education and Sports Management*, *8*(2), 11-25. https://doi.org/10.5897/JPESM2020.0321
6. Smith, D., & Lee, M. (2021). Enhancing athletic performance through technology integration: A review of current practices. *Sports Technology Journal*, *9*(1), 33-44. https://doi.org/10.1080/19346182.2021.1878290
7. Smith, T., & Zhao, Q. (2021). Player-coach relationships and athletic success: Insights from professional sports. *Journal of Coaching and Sports Development*, *10*(3), 101-115. https://doi.org/10.1123/jcsd.2021-0234
8. Taylor, A., & Roberts, H. (2020). Cultural influences on sports participation and performance: A sociological perspective. *International Journal of Sports Sociology*, *11*(2), 211-226. https://doi.org/10.1007/s11266-020-00733-4
9. Williams, B., & Chen, L. (2021). The role of technology in improving decision-making and precision in sports training. *Sports Science & Coaching*, *19*(4), 321-337. https://doi.org/10.1177/1747954121983789
10. Williams, D., & Roberts, A. (2020). The role of cultural and community support in sports performance. *Journal of Sport and Society*, *15*(3), 305-318. https://doi.org/10.1177/0891243220919143