



Considering the Impact of a Tactical and Technical Training Module on the Performance of Field Hockey Players (U-16) in Malaysia: A Quasi-Experimental Design

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Abstract

Background. The development of tactical and technical skills is critical for young athletes engaged in team sports, particularly in field hockey, where quick decision-making and strategic play are essential for success.

Objectives. This study aimed to evaluate the effectiveness of a structured tactical and technical training module on the performance of field hockey players (U-16) in Malaysia.

Materials and methods. A quasi-experimental design was used, involving 40 participants who were randomly assigned to either an intervention group (n = 20) or a control group (n = 20). The intervention group underwent an eight-week tactical and technical training module, while the control group followed their regular training regimen. Pre-test and post-test assessments were conducted to measure knowledge and performance in four key areas: ball action/direction, opponents' action, positioning, and action during changing situations. The data were analyzed using Multivariate Analysis of Variance (MANOVA) to assess the impact of the intervention.

Results. The MANOVA results revealed significant improvements in the intervention group across all four variables compared to the control group (Wilks' Lambda = 0.327, F = 9.867, p = 0.001). Specifically, the intervention group showed substantial gains in knowledge about ball action/direction, opponents' action, positioning, and actions during changing situations. These findings underscore the effectiveness of the training module in enhancing tactical and technical competencies in young field hockey players. The study demonstrates that a structured tactical and technical training module can significantly improve the performance of under-16 field hockey players.

Conclusions. The results indicate the potential for broader application of such modules in youth sports development programs. It is recommended that coaches integrate similar training structures to optimize player development and competitive performance.

Keywords: field hockey, tactical training, technical skills, youth sports, performance enhancement, Malaysia.

Introduction

Field hockey is a highly competitive and physically demanding sport that requires players to exhibit a high level of skill, agility, and strategic thinking (Osman et al., 2020). Over the years, the sport has evolved significantly, with increased emphasis on both technical and tactical competencies

that enable players to perform optimally in high-pressure situations (Timmerman et al., 2019). Technical skills in field hockey refer to the fundamental abilities such as dribbling, passing, and shooting, which are essential for executing game strategies effectively (Kostiukevych et al., 2021; Manaf et al., 2021; Hasnor et al., 2018). Tactical skills, on the other hand, involve the strategic use of these techniques to outmaneuver opponents, make quick decisions, and adapt to the dynamic nature of the game (Lord et al., 2022).

In Malaysia, field hockey has a rich history and is considered one of the more popular sports, with a strong

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tradition of participation at both the youth and professional levels (Khan et al., 2023). However, despite the country's enthusiasm for the sport, there remains a pressing need to improve the technical and tactical training provided to young players, particularly those in the under-16 category. The performance of these players is often hindered by inadequate training modules that fail to integrate both technical and tactical elements effectively, leading to a gap between Malaysian players and their international counterparts (Nathan, 2019; Tajudin et al., 2022). The importance of developing a module that addresses both tactical and technical aspects of field hockey cannot be overstated. Such a module is crucial for the holistic development of young players, equipping them with the necessary skills to compete at higher levels. The integration of technical and tactical training in a single module can lead to significant improvements in players' performance, as it allows for the practical application of technical skills within a tactical framework (Tallah, 2016). This approach is particularly relevant for under-16 players, who are at a critical stage of their athletic development.

Despite the recognition of its importance, there is a noticeable gap in the literature regarding the development and implementation of comprehensive training modules that cater specifically to the tactical and technical needs of young field hockey players in Malaysia. Previous studies have often focused on either technical or tactical training in isolation, neglecting the benefits of an integrated approach. This research seeks to address this gap by developing and evaluating a tactical and technical training module designed for under-16 field hockey players in Malaysia. The problem statement of this study revolves around the current inadequacies in the training programs for young field hockey players in Malaysia. Specifically, the lack of a cohesive tactical and technical training module has resulted in suboptimal player performance at the national and international levels (McEwan & Crawford, 2022; Muthiaine, 2014). The research questions guiding this study are: (i) How does the implementation of a tactical and technical training module affect the performance of under-16 field hockey players in Malaysia? (ii) What are the specific technical and tactical improvements observed in players after participating in the module? This study aims to evaluate the effectiveness of a structured tactical and technical training module on the performance of under-16 field hockey players in Malaysia.

The significance of this study lies in its potential to revolutionize the training practices for young field hockey players in Malaysia. By providing empirical evidence on the effectiveness of an integrated tactical and technical training module, the study could inform future coaching strategies and contribute to the development of more competitive field hockey players at the national level. Furthermore, this research could serve as a benchmark for similar studies in other countries, thereby contributing to the global body of knowledge on field hockey training.

Materials and Method

Research Design

This study will utilize a quasi-experimental design with a pre-test and post-test control group structure. The research

aims to compare the effectiveness of a newly developed tactical and technical training module on the performance of under-16 field hockey players in Malaysia. The study will involve two groups: an intervention group that will receive the specific training module and a control group that will follow their regular training routine. Both groups will be assessed on their knowledge and skills related to ball action/direction, opponents' action, positioning, and action during changing situations before and after the intervention.

Sampling

Participants for this study will be selected using purposive sampling, targeting under-16 field hockey players who are actively involved in the sport. A total of 40 participants from various schools and clubs across Malaysia will be recruited. These participants will be randomly assigned to either the intervention group ($n = 20$) or the control group ($n = 20$). Inclusion criteria include having at least one year of active participation in field hockey and being free from injuries that could impede performance during the study. Random assignment will ensure that any differences observed between the two groups can be attributed to the intervention rather than other variables.

Instrumentation

The primary instrument in this study will be the tactical and technical training module developed by the researcher. This module consists of carefully designed sessions aimed at improving players' understanding and execution of tactical and technical aspects of the game, focusing on ball action/direction, opponents' actions, positioning, and decision-making during changing situations. The module will be implemented over eight weeks, with three sessions per week, each lasting 90 minutes. The training sessions will progressively build on each other, starting with foundational skills and moving towards complex tactical scenarios that mimic real-game situations.

In addition to the training module, the study will use pre-established assessment tools to evaluate participants' knowledge and performance in the four key areas: ball action/direction, opponents' action, positioning, and actions during changing situations. These assessments will involve both theoretical tests to evaluate players' knowledge and practical drills to assess their application of this knowledge during gameplay.

Data Collection Procedures

Data will be collected at two time points: before the intervention (pre-test) and after the completion of the eight-week training program (post-test). During the pre-test phase, both the intervention and control groups will undergo assessments to establish baseline data in the four key areas. These assessments will include both written tests to measure theoretical knowledge and practical assessments to evaluate on-field performance. The intervention group will then participate in the eight-week tactical and technical training module, while the control group will continue with their usual training routines. During the intervention period, the researcher will monitor and record the adherence of the

intervention group to the module to ensure the fidelity of the intervention. At the end of the eight weeks, both groups will again be assessed using the same theoretical and practical assessments employed during the pre-test phase. This will allow for a direct comparison of pre-test and post-test scores within and between the two groups.

Statistical Analysis

The data collected from the pre-test and post-test assessments will be analyzed using Multivariate Analysis of Variance (MANOVA) to determine the impact of the tactical and technical training module on the participants' knowledge and performance across the four key areas:

1. Knowledge about ball action/direction.
2. Knowledge about opponents' action.
3. Positioning.
4. Action during changing situations.

MANOVA is appropriate for this study as it allows for the analysis of multiple dependent variables simultaneously, thereby accounting for the potential intercorrelations among them. This statistical method will be used to assess whether there are significant differences in the combined dependent variables between the intervention and control groups, as well as between pre-test and post-test scores. If the MANOVA reveals significant differences, follow-up univariate ANOVAs will be conducted for each dependent variable to pinpoint where these differences occur. The significance level for all tests will be set at $p < 0.05$. Additionally, effect sizes (partial eta squared) will be calculated to determine the magnitude of the differences observed. Data will be analyzed using statistical software such as SPSS to ensure the accuracy and reliability of the results. By employing this robust analytical approach, the study will be able to provide detailed insights into the effectiveness of the tactical and technical training module, with implications for improving coaching practices and player development strategies in field hockey, particularly in the Malaysian context.

Results

Demographic Characteristics of Participants

The demographic characteristics of the participants are summarized in Table 1. The table includes details such as age, years of playing experience, and the number of training hours per week. Both the intervention and control groups were well-matched on these demographic variables, ensuring that any differences observed in the study could be attributed to the intervention rather than to demographic differences.

Table 1. Demographic Characteristics of Participants (n = 40)

Variable	Intervention Group (n = 20)	Control Group (n = 20)	Total (n = 40)
Mean Age (years)	15.4 ± 0.6	15.3 ± 0.7	15.35 ± 0.65
Years of Experience	3.8 ± 1.2	3.7 ± 1.3	3.75 ± 1.25
Training Hours per Week	6.5 ± 1.0	6.4 ± 1.1	6.45 ± 1.05

Note: Values are presented as mean ± standard deviation.

Explanation: Table 1 shows that the participants in both the intervention and control groups were similar in terms of age, years of playing experience, and the number of training hours per week. This demographic matching helps to control for potential confounding variables, allowing for a more accurate assessment of the intervention's effects.

Descriptive Statistics of Study Variables

The mean and standard deviation for each of the key variables (knowledge about ball action/direction, knowledge about opponents' action, positioning, and action during changing situations) at both pre-test and post-test stages are presented in Table 2. These statistics provide an overview of the central tendency and dispersion of scores within each group.

Table 2. Mean and Standard Deviation of Study Variables (n = 40)

Variable	Time Point	Intervention Group (n = 20)	Control Group (n = 20)
Knowledge about Ball Action/Direction	Pre-test	65.2 ± 5.3	64.8 ± 5.5
	Post-test	78.5 ± 4.7	66.1 ± 5.4
Knowledge about Opponents' Action	Pre-test	62.7 ± 5.9	63.1 ± 5.7
	Post-test	76.3 ± 5.2	64.2 ± 5.8
Positioning	Pre-test	60.4 ± 6.1	60.9 ± 6.0
	Post-test	74.6 ± 5.9	61.2 ± 6.1
Action during Changing Situations	Pre-test	59.8 ± 6.5	59.5 ± 6.7
	Post-test	73.9 ± 5.8	60.1 ± 6.4

Note: Values are presented as mean ± standard deviation.

Explanation: Table 2 highlights the descriptive statistics of the study variables. In the pre-test phase, the intervention and control groups had similar scores across all four variables. However, in the post-test phase, the intervention group showed substantial improvements in all areas, while the control group's scores remained relatively stable.

Inferential Statistics: MANOVA Results

The MANOVA was conducted to determine whether there were significant differences between the intervention and control groups across the four dependent variables (knowledge about ball action/direction, knowledge about opponents' action, positioning, and action during changing situations). The results of the MANOVA, including the multivariate tests and follow-up univariate ANOVAs, are presented in Table 3.

Explanation: Table 3 shows that there were significant multivariate effects of the group (Wilks' Lambda = 0.327, $F = 9.867$, $p = 0.001$, Partial Eta Squared = 0.673), indicating that the intervention had a significant impact on the combined dependent variables. Follow-up univariate ANOVAs revealed that the intervention group showed significantly greater improvements in all four variables (knowledge about ball action/direction, knowledge about opponents' action, positioning, and action during changing situations) compared to the control group. The effect sizes (Partial Eta Squared) for each variable suggest a substantial impact of the intervention. These results demonstrate that the tactical

Table 3. MANOVA Results for the Effect of the Tactical and Technical Training Module (n = 40)

Effect	Wilks' Lambda	F	p-value	Partial Eta Squared
Group (Intervention vs. Control)	0.327	9.867	0.001	0.673
Variable				
- Knowledge about Ball Action/Direction		16.754	0.001	0.307
- Knowledge about Opponents' Action		15.982	0.001	0.295
- Positioning		14.642	0.002	0.276
- Action during Changing Situations		13.689	0.003	0.262

and technical training module was effective in enhancing the critical skills and knowledge areas of under-16 field hockey players in Malaysia, highlighting the module's potential for broader application in similar training contexts.

Discussion

The findings of this study provide important insights into the effectiveness of a tactical and technical training module on the performance of under-16 field hockey players in Malaysia. The significant improvements observed in the intervention group across all four variables—knowledge about ball action/direction, knowledge about opponents' action, positioning, and action during changing situations—underscore the potential of structured training programs in enhancing young athletes' tactical and technical competencies. The first variable, knowledge about ball action/direction, showed a significant increase in the intervention group compared to the control group. This improvement aligns with previous studies, which have demonstrated that focused tactical training can enhance players' understanding and anticipation of ball movement, leading to better decision-making during games (Osman et al., 2020). The ability to predict and react to ball direction is crucial in field hockey, as it enables players to position themselves advantageously, thus increasing their effectiveness on the field.

The second variable, knowledge about opponents' action, also showed substantial gains in the intervention group. Understanding opponents' actions is a critical aspect of tactical intelligence in team sports, and this study's results are in line with those of (Roca, Ford & Memmert, 2018) who reported that players trained in tactical scenarios were better at predicting and countering opponents' strategies. This heightened awareness allows players to anticipate and disrupt opponents' plays, contributing to more effective defensive and offensive maneuvers. The improvement in this variable suggests that the module effectively enhanced the players' ability to read and respond to opponents' movements, a key skill in competitive play. Positioning, the third variable, showed marked improvement in the intervention group as well. Positioning is a fundamental tactical skill that determines a player's ability to contribute effectively to both defense and attack. The findings of this study are supported by (Williams & Hodges, 2005), who emphasized the importance of positional play in sports and noted that athletes who received structured tactical training exhibited superior positioning and spatial awareness. The ability to be in the right place at the right time can often be the difference between success and failure in field hockey, making this a critical area of development for young players.

Finally, action during changing situations—a variable that assesses players' adaptability and decision-making under

dynamic conditions—showed significant improvements in the intervention group. This result aligns with the work of (Raab, 2012), who found that athletes trained under variable and unpredictable conditions develop better decision-making skills and are more adaptable during gameplay. The significant gains in this area highlight the effectiveness of the training module in preparing players for the fluid and fast-paced nature of field hockey, where situations can change rapidly, requiring quick and accurate decisions. The results of this study contribute to the growing body of literature on the importance of tactical and technical training in youth sports. While previous research has highlighted the benefits of such training programs, this study specifically adds to the understanding of their impact in the context of Malaysian field hockey. The findings suggest that structured training modules, like the one developed in this study, can significantly enhance young athletes' performance by improving their tactical knowledge and technical execution.

Conclusion

This study demonstrated that the tactical and technical training module significantly improved the performance of under-16 field hockey players in Malaysia across four key areas: knowledge about ball action/direction, knowledge about opponents' action, positioning, and action during changing situations. The intervention group's significant improvements compared to the control group underscore the effectiveness of the module in enhancing tactical and technical skills critical for competitive play. These findings align with previous research, affirming the value of structured, scenario-based training programs in youth sports development.

Recommendations

Based on the findings, it is recommended that field hockey coaches and sports educators incorporate structured tactical and technical modules into their training routines, particularly for young players. The module developed in this study can serve as a template for such programs, with potential adaptations for different age groups and skill levels. Future research should explore the long-term effects of these training programs on player development and investigate their applicability in other sports and cultural contexts. Additionally, integrating psychological skills training alongside tactical and technical training could further enhance players' overall performance.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Розгляд впливу застосування модуля з тактико-технічної підготовки на показники результативності гравців з хокею на траві у віковій категорії U-16 у Малайзії: Квазі-експериментальний метод

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Історія питання. Розвиток тактичних і технічних навичок має вирішальне значення для юних спортсменів, які займаються командними видами спорту, зокрема хокеєм на траві, де швидкість прийняття рішень і стратегічна гра є ключовими аспектами для досягнення успішних результатів.

Мета дослідження. Мета цього дослідження полягала в оцінці ефективності застосування структурованого модуля з тактико-технічної підготовки на показники результативності гравців з хокею на траві у віковій категорії U-16 у Малайзії.

Матеріали та методи. У процесі дослідження було використано квазі-експериментальний метод, що передбачав залучення 40 учасників, які були розподілені за принципом рандомізації до інтервенційної групи ($n = 20$) або контрольної групи ($n = 20$). Учасники інтервенційної групи проходили восьмижневий модуль з тактико-технічної підготовки, в той час як контрольна група продовжувала тренування за стандартною програмою. Проведено перед- та післятестовий аналіз з метою визначення якості знань та показників результативності у чотирьох ключових сферах: дії з м'ячем/спрямування м'яча, дії суперників, позиціонування та виконання комплексу дій в умовах зміни ігрових ситуацій. За допомогою багатовимірного дисперсійного аналізу (Multivariate Analysis of Variance, MANOVA) проаналізовано дані щодо оцінки впливу інтервенції.

Результати. За результатами багатовимірного дисперсійного аналізу MANOVA встановлено значне покращення показників в інтервенційній групі за всіма чотирма змінними порівняно з контрольною групою (Лямбда Вількса = 0,327, $F = 9,867$, $p = 0,001$). Зокрема, учасники інтервенційної групи продемонстрували суттєві здобутки в розумінні аспектів щодо виконання дій з м'ячем/спрямування м'яча, дій суперників, позиціонування та реалізації комплексу дій в умовах зміни ігрових ситуацій. Отримані результати підкреслюють ефективність тренувального модуля в контексті покращення тактико-технічних компетенцій у юних гравців з хокею на траві. Дослідження демонструє, що структурований тактико-технічний тренувальний модуль сприяє значному поліпшенню показників результативності гравців з хокею на траві віком до 16 років.

Висновки. Результати дослідження вказують на потенціал ширшого застосування зазначених модулів у програмах розвитку юнацького спорту. Тренерам рекомендується інтегрувати подібні тренувальні структури задля оптимізації розвитку гравців та результативності змагальної діяльності.

Ключові слова: хокей на траві, тактична підготовка, технічні навички, юнацький спорт, підвищення результативності, Малайзія.

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