Developing A Street Tennis Module for Tennis Education Expert-Validated Design

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ABSTRACT

This study focuses on the design of a tennis readiness module for children, especially primary school students, uniquely adapted from the principles of street tennis. Employing a dynamic mixed-methods approach, the research seamlessly integrates expert insights through Focus Group Discussions (FGD) and the Fuzzy Delphi Method (FDM) to meticulously refine the module's components. During the FGDs, three handpicked experts rigorously scrutinized the proposed elements, providing critical feedback to enhance their practical application in real-world teaching. Further validation was pursued through the FDM, which involved the participation of 20 certified tennis coaches by International Tennis Federation (ITF), five tennis coaches from abroad, and two university lecturers in the field of sport coaching. These coaches evaluated the proposed components, with their qualitative assessments transformed into quantifiable data using Triangular Fuzzy Numbers (TFN), ensuring precision in capturing expert consensus. The data show that all proposed elements are surpassing the required agreement threshold, confirming their validity for inclusion in the module. As a result, two core components and six detailed elements were unanimously approved, underscoring the module's robustness and potential to significantly impact tennis education at the primary level. This innovative process not only highlights the importance of expert-driven validation but also paves the way for future educational interventions grounded in empirical rigor and practical relevance.

Keywords: street tennis model, tennis education, Fuzzy Delphi Method (FDM), sports curriculum development.

INTRODUCTION

The role of sports in shaping children's physical, cognitive, and social development has been extensively documented. Regular participation in physical activities is associated with numerous health benefits, including enhanced motor skills, better cardiovascular health, and improved mental well-being (Bailey et al., 2013; Biddle & Asare, 2011). Beyond physical health, sports also play a critical role in fostering social cohesion, teamwork, and leadership skills among young participants (Eimer et al., 2013). However, access to sports, particularly in resource-limited environments, remains a significant barrier to inclusive participation. In many developing countries, infrastructure deficiencies impede children's involvement in sports, particularly those that require specialized facilities, such as tennis (Kirk & MacPhail, 2003; Coakley, 2011). Tennis, a sport traditionally associated with wealthier, urban settings, is often out of reach for children in rural or underprivileged areas due to the need for formal tennis courts and equipment (Fuller, 2018; Parker & Curtner-Smith, 2012). In Malaysia, despite efforts by the Lawn Tennis Association of Malaysia (LTAM) to promote tennis, the sport has not reached the popularity levels of other racquet sports like badminton and squash (LTAM, 2022). The lack of infrastructure in schools, particularly primary schools, exacerbates this issue, with many institutions unable to provide the necessary facilities for introducing tennis to their students (Abdullah et al., 2019). As a result, tennis has remained a largely inaccessible sport for many Malaysian children, limiting their opportunities for participation and skill development (Wilson & Hay, 2010).

One solution to this challenge is the introduction of street tennis, a modified version of the sport that can be played on any surface with simplified equipment. Street tennis eliminates the need for formal courts, making the sport accessible to schools and communities with limited resources (Tomov et al., 2021). This adaptation aligns with research emphasizing the importance of early exposure to sports, which is critical in fostering lifelong participation and developing foundational motor skills (Belyi & Hamilton, 2004; Baker, Cobley, & Fraser-Thomas, 2009). Studies have shown that when children are introduced to sports in a supportive and inclusive environment, they are more likely to continue participating throughout their lives, contributing to both their physical and psychological well-being (Crane & Temple, 2015; García Bengoechea & Strean, 2007).

In the context of Malaysian primary schools, where formal sports infrastructure is often lacking, street tennis presents a valuable opportunity to engage children in physical activity and introduce them to tennis in a more accessible format. Rahman & Hizan (2024) revealed limits on tennis in primary schools, including lack of infrastructure (tennis court), inadequate equipment, support systems, and student commitment. Hence, this study aims to develop a readiness module for street tennis using the Fuzzy Delphi Method to achieving an expert consensus of the design. The module is designed to equip teachers with the resources to teach basic tennis skills without the need for traditional infrastructure, thereby promoting inclusivity and participation in schools that lack formal sports facilities (Chow et al., 2007; Light & Evans, 2013). Theoretical frameworks such as Teaching Games for Understanding (TGFU), Stages of Learning Theories (SLT) and the Taba Curriculum Model underpin the development of this module. The TGFU model emphasizes the teaching of tactical awareness and decision-making skills in games, encouraging children to think critically and adapt their strategies as they play (Bunker & Thorpe, 1982). This model has been shown to be particularly effective in engaging children in sports and enhancing their enjoyment and understanding of the game (Butler & Griffin, 2010; Oslin & Mitchell, 2006). Hence, SLT emphasizes learning tennis skills through observation, imitation, and social interaction, helping to enhance students' interest and competence in primary schools (Johnson et al, 2019). Similarly, the Taba Curriculum Model advocates for a bottom-up approach to curriculum design, where teachers play a key role in shaping the learning experiences of their students (Taba, 1962). This model ensures that the module is tailored to the specific needs and contexts of the schools and teachers involved, promoting a more personalized and effective learning experience (Burns, 2023; Krull, 2003).

This study’s contribution to the field is twofold. First, it addresses a practical gap by providing a solution to the lack of tennis facilities in primary schools, empowering teachers to introduce tennis through a more accessible format. Second, it contributes to the growing body of literature on inclusive sports education, highlighting how modified sports can be used to overcome infrastructural challenges and promote broader participation (Thorpe et al., 2018). The findings of this study have implications not only for the development of tennis in Malaysia but also for other countries facing similar challenges in sports infrastructure. By making tennis more accessible, the module promotes inclusivity, enhances physical education, and aligns with global efforts to provide every child with the opportunity to engage in meaningful sports activities (Francesconi, 2021; Rai et al., 2019).

METHOD

Research participants

The participants involved in this study were essential to ensuring the successful development and evaluation of the street tennis readiness module. This research involved three tennis development experts from Lawn Tennis Association Malaysia (LTAM) for the formulation of the main components and elements of the module (table 1). Subsequently, the researcher appointed 20 certified tennis coaches, accredited by the International Tennis Federation (ITF), as Fuzzy Delphi Method (FDM) experts to gain consensus on the components, elements, and content of the developed module (table 2). To further strengthen the findings of the FDM, the researcher also engaged five tennis coaches from abroad and two university lecturers in the field of sport coaching as external experts to ensure that the components and elements align with the latest global tennis teaching methods and To ensure that the developed module meets the standards and guidelines of the Malaysian curriculum, in alignment with the national educational requirements (table 3).

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Table 1. Research participant for formulation of the main component and element.

Expert	Position	Expertise	Experience (years)
P1	Director of the Coaching Education Division, LTAM	Tennis development programme	<20
P2	National Coaching tutor, LTAM	Tennis Coaching	<15
P3	National Coaching tutor, LTAM	Tennis Coaching	<15

Table 2. FDM experts

Expert	Position	Education	Expertise	Experience (years)
P1	University lecturer / Certified coach	Ph.D.	School curriculum/ Tennis Coaching	<20
P2	Certified coach	Diploma	Tennis Coaching	5-9
P3	Certified coach	Degree	Tennis Coaching	10-14
P4	Certified coach	Degree	Tennis Coaching	5-9
P5	Certified coach	Degree	Tennis Coaching	5-9
P6	Certified coach	Master	Tennis Coaching	<20
P7	Certified coach	Diploma	Tennis Coaching	5-9
P8	Certified coach	Degree	Tennis Coaching	5-9
P9	Certified coach	Degree	Tennis Coaching	<20
P10	Certified coach	Degree	Tennis Coaching	5-9
P11	Certified coach	Degree	Tennis Coaching	5-9
P12	Certified coach	Degree	Sport science / Tennis Coaching	5-9
P13	Certified coach	Degree	Tennis Coaching	5-9
P14	Certified coach	Degree	Tennis Coaching	10-14
P15	Certified coach	Degree	Tennis Coaching	5-9
P16	Certified coach	Degree	Tennis Coaching	10-14

P17	Certified coach	Degree	Tennis Coaching	5-9
P18	Certified coach	Degree	Tennis Coaching	10-14
P19	Certified coach	Degree	Tennis Coaching	5-9
P20	Certified coach	Degree	Tennis Coaching	15-19

Table 3. Experts assigned to reinforce the FDM data (External expert)

Expert	Position	Education	Expertise	Experience (years)	Country
P1	Tennis coach, Guiyang University, China	Master	Tennis Coaching	<20	China
P2	Tennis coach, Brgy. San Miguel Tennis Club, Illigan City	Degree	Tennis Coaching	10-14	Filipina
P3	Tennis coach, Pro Tennis Coach Academy, London	Master	Tennis Coaching	10-14	United Kingdom
P4	Tennis coach, Fit In Tennis Academy, Barcelona	Master	Tennis Coaching	5-9	Spain
P5	Tennis coach, Eildon Park Tennis Club, Rowville	Degree	Tennis Coaching	10-14	Australia
P6	Malaysia Sarawak University Lecturer	Ph.D.	Sport Coaching/ Curriculum Module	12	Malaysia
P7	Sultan Idris Education University Lecturer	Ph.D.	Sport Psychology / Physical Education	18	Malaysia

Data collections

The data collection process utilized three key methods. First, Focus Group Discussions (FGD) were conducted with three experts to provide initial insights and propose core components and elements for the module. Next, the Fuzzy Delphi Method (FDM) was employed, gathering 20 certified tennis coaches in a workshop to capture consensus on the module's components, elements, skills, and activities. The FDM questionnaire, adapted from Zarina Eshak, facilitated this by converting expert evaluations into quantitative data during group meetings. Finally, a FDM data was further strengthened with five international experts and two university lecturers through a combination of face-to-face and online sessions. This final step ensured that the module's components not only aligned with Malaysian standards but also adhered to global best practices. These rigorous methods collectively refined the module, enhancing both its local relevance and international applicability. The data collection was meticulously planned and executed, with ethical considerations and approvals obtained from all relevant authorities. This thorough approach ensured that the module was rigorously tested and refined, making it a valuable resource for promoting tennis in primary schools, even without traditional tennis facilities.

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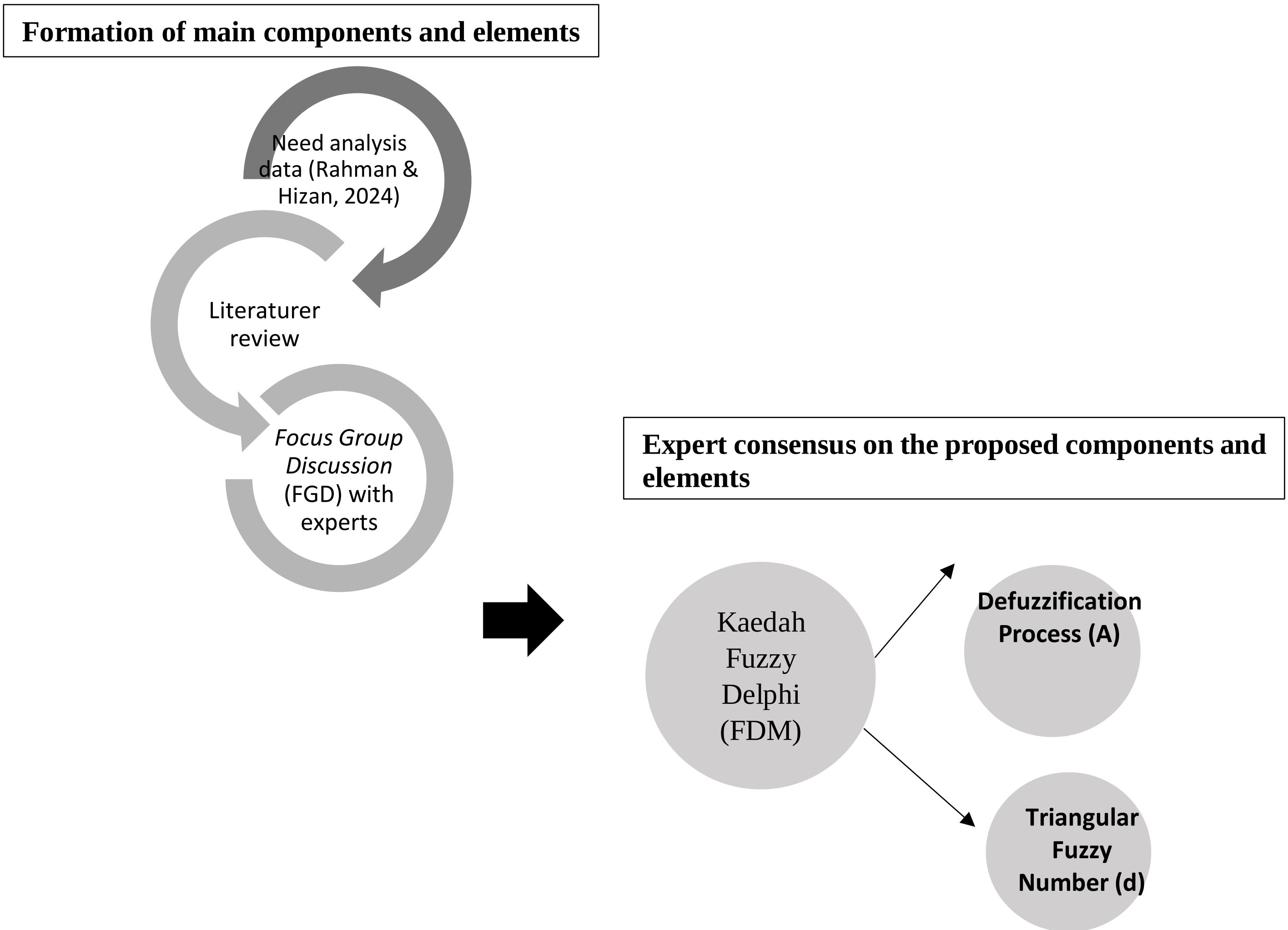

Figure 1. Methods used for the design and development of the module

Data analysis

In this study, the researcher used the Fuzzy Delphi Method (FDM) to collect data. The collected data were analysed using Triangular Fuzzy Numbers (TFN) and the Defuzzification Process. At the TFN stage, there are three conditions that must be adhered to by the researcher in determining the acceptance of an element being studied by expert consensus: it must involve the threshold value (d), the percentage of the expert group for a given element, and the fuzzy score (A). The TFN consists of the values m1, m2, and m3. The m1 value represents the minimum value, while m2 is the most reasonable value. Additionally, m3 refers to the maximum value. These values (m1, m2, and m3) can be visualized more clearly through a triangular graph plotting the mean against the triangular values. Based on Figure 3.14, these three values are shown within the range of 0 to 1, which aligns with the fuzzy numbers (Faizi et al., 2020). The conversion of linguistic variables into Triangular Fuzzy Numbers (TFN) (m1, m2, and m3) is an essential step to capture uncertainty and ambiguity in the data collected from experts. Below is the method for converting linguistic variables, specifically a 7-point Likert scale, into TFN form:

Table 4. 7-point linguistic variable scale

Level of agreement	Likert scale	Triangular Fuzzy Number (TFN)		
Completely agree	7	0.9	1	1
Strongly agree	6	0.7	0.9	1
Agree	5	0.5	0.7	0.9
Moderate agree	4	0.3	0.5	0.7

Disagree	3	0.1	0.3	0.5
Strongly disagree	2	0	0.1	0.3
Completely disagree	1	0	0	0.1

Source: Mohd Ridhuan (2016)

Based on the table above, for the item "strongly agree" on the Likert scale at level 6, the TFN = (0.7, 0.9, 1.0) provides a fuzzy assessment that captures the uncertainty in this response, where the minimum value is 0.7, the most likely value is 0.9, and the maximum value is 1.0.The first condition for Triangular Fuzzy Numbers is that the threshold value (d) must be less than or equal to 0.2 (Mohd Ridhuan & Nurulrabihah, 2020). Therefore, the vertex method is used to calculate the distance between the mean rij. The threshold value (d) for two fuzzy numbers, m = (m1, m2, m3) and n = (n1, n2, n3), is calculated using the following formula:

$$d(\tilde{m},\tilde{n}) = \sqrt{\frac{1}{3}\left[(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2\right]}.$$

This formula measures the distance between two fuzzy numbers and helps determine whether they meet the threshold condition for consensus. For the second condition, which pertains to the percentage of expert group agreement for a particular element, the percentage of expert consensus must be equal to or greater than 75.0% (Mohamed Yusoff, Hashim, Muhamad & Wan Hamat, 2021). The third condition involves the analysis of data using the average of fuzzy numbers or average response (Defuzzification Process). This analysis aims to obtain the fuzzy score (A). To meet the third condition, the fuzzy score (A) must be greater than or equal to the median (α-cut value), which is 0.5 (Fadzil & Fadzil, 2021). When the fuzzy score (A) meets or exceeds the median value, it indicates that the element is accepted by expert consensus. Another function of the fuzzy score (A) is that it can be used to determine the ranking and priority of an element based on expert consensus. The formula to calculate the fuzzy score (A) is A = (1/3) *(m1+m2+m3). Both the Triangular Fuzzy Number and defuzzification processes are analysed using Microsoft Excel, guided by the formulas mentioned above. This ensures that the data is accurately processed for expert validation and consensus.

FINDINGS

Main components, elements and key contents of the module

Based on the analysis of the Fuzzy Delphi Method (FDM) on the main components of the tennis readiness module based on street tennis, the findings of this study show the threshold value (d), expert consensus percentage (%), and Fuzzy score (A) for the two main components of the module as follows:

Table 5. Main components of the tennis readiness module based on street tennis according to FDM analysis

No.	Item	Triangular Fuzzy Numbers		Fuzzy Evaluation Process				Consensus	Accepted Element
		Threshold, d	Percentages, %	m1	m2	m3	Fuzzy score (A)		
FDM experts									
1	Tactical	0.146	95.0%	0.750	0.900	0.970	0.873	Accepted	0.873
2	Technical	0.132	100.0%	0.780	0.920	0.980	0.893	Accepted	0.893
FDM reinforcement									
1	Tactical	0.177	100.0%	0.700	0.857	0.957	0.838	Accepted	0.838
2	Technical	0.156	100.0%	0.757	0.900	0.971	0.876	Accepted	0.876

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Table 5 shows that the panel of experts agreed on two main components of the module, with technical component ranked first and tactical component second. External experts also confirmed this ranking with similar defuzzification values. Through the questionnaire, the FDM experts provided comments and suggestions, emphasizing the importance of balancing tactical and technical skills in tennis training. The experts agreed that a tactical-before-technical approach is crucial, especially for children, to ensure that learning and training are both enjoyable and effective. Subsequently, the researcher conducted an in-depth analysis of the data pertaining to the elements associated with the core components of the module. Table 6 below presents the research findings for the elements of the core components of the module, based on expert consensus:

Table 6. Elements of the tennis readiness module based on street tennis according to FDM analysis

No.	Item	Triangular Fuzzy Numbers		Fuzzy Evaluation Process				Consensus	Accepted Element
		d	%	m1	m2	m3	(A)		
FDM experts:									
Tactical									
1	Consistency	0.064	100.0%	0.840	0.970	1.000	0.937	Accepted	0.937
2	Move the opponent	0.117	100.0%	0.780	0.925	0.985	0.897	Accepted	0.897
3	Optimal court positioning	0.085	95.0%	0.820	0.955	0.995	0.923	Accepted	0.923
Technical									
1	Rally	0.128	100.0%	0.760	0.910	0.980	0.883	Accepted	0.883
2	Approaching the net	0.137	90.0%	0.760	0.910	0.970	0.880	Accepted	0.880
3	Serve and return	0.103	90.0%	0.790	0.935	0.990	0.905	Accepted	0.905
FDM reinforcement:									
Tactical									
1	Consistency	0.062	100.0%	0.843	0.971	1.000	0.938	Accepted	0.938
2	Move the opponent	0.159	100.0%	0.671	0.843	0.957	0.824	Accepted	0.824
3	Good positioning	0.107	100.0%	0.757	0.914	0.986	0.886	Accepted	0.886
Technical									
1	Rally	0.141	100.0%	0.643	0.829	0.957	0.810	Accepted	0.810
2	Approaching the net	0.189	85.7%	0.671	0.843	0.943	0.819	Accepted	0.819
3	Serve and return	0.107	100.0%	0.757	0.914	0.986	0.886	Accepted	0.886

Table 6 shows that the panel of experts accepted three elements within the tactical component and three elements within the technical component. Tactical elements such as consistency, moving the opponent, and optimal court positioning received high levels of agreement. Similarly, technical elements such as rally, approaching the net, as well as serving and returning, were highly endorsed. External experts also supported these findings, emphasizing the importance of balance between these two components, where strong technical components are necessary to effectively execute tactical strategies, ensuring players can reach their full potential on the court.

Afterwards, the discussion proceeds with a comprehensive analysis of the skill types associated with the main components of the module as table 7 below:

Table 7. Types of skills for the tactical and technical components based on the FDM analysis

No.	Item	Triangular Fuzzy Numbers		Fuzzy Evaluation Process				Consensus	Accepted Element
		d	%	m1	m2	m3	(A)		
FDM experts:									
Tactical									
1	Sending	0.081	95.0%	0.830	0.960	0.995	0.928	Accepted	0.928
2	Receiving	0.106	95.0%	0.800	0.940	0.985	0.908	Accepted	0.908
Technical									
1	Forehand	0.057	100.0%	0.850	0.975	1.000	0.942	Accepted	0.942
2	Backhand	0.057	100.0%	0.850	0.975	1.000	0.942	Accepted	0.942
3	Volley	0.093	90.0%	0.830	0.955	0.990	0.925	Accepted	0.925
4	Service	0.039	100.0%	0.870	0.985	1.000	0.952	Accepted	0.952
FDM reinforcement:									
Tactical									
1	Sending	0.111	85.7%	0.814	0.943	0.986	0.914	Accepted	0.914
2	Receiving	0.171	85.7%	0.757	0.900	0.957	0.871	Accepted	0.871
Technical									
1	Forehand	0.075	100.0%	0.786	0.943	1.000	0.910	Accepted	0.910
2	Backhand	0.075	100.0%	0.786	0.943	1.000	0.910	Accepted	0.910
3	Volley	0.156	100.0%	0.757	0.900	0.971	0.876	Accepted	0.876
4	Service	0.062	100.00%	0.843	0.971	1.000	0.938	Accepted	0.938

Based on table 7, both skills within the tactical component, which is sending and receiving, as well as all four skills in the technical component, such as forehand, backhand, volley, and serve, were accepted by all experts. This agreement was further reinforced by external experts, who also validated these skills with corresponding Defuzzification values. The experts emphasized the importance of a strong foundation in both tactical and technical skills to achieve high performance in tennis, as well as the need for a balanced training program tailored to the individual needs of players. Subsequently, a comprehensive analysis of the types of activities related to the main components of the module is presented, as shown in Table 8 below:

Table 8. Types of activities for the tactical and technical components based on the FDM analysis

No.	Item	Triangular Fuzzy Numbers		Fuzzy Evaluation Process				Consensus	Accepted Element
		d	%	m1	m2	m3	(A)		
FDM experts:									

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Tactical									
1	Sense of the ball	0.157	95.0%	0.770	0.910	0.965	0.882	Accepted	0.882
2	Sense of the ball and racket	0.120	95.0%	0.780	0.925	0.980	0.895	Accepted	0.895
3	Sense of the ball, racket and net	0.101	90.0%	0.810	0.945	0.990	0.915	Accepted	0.915
Technical									
1	The game begins	0.087	95.0%	0.780	0.935	0.995	0.903	Accepted	0.903
2	Drills	0.057	100.0%	0.850	0.975	1.000	0.942	Accepted	0.942
3	Play with conditions	0.064	100.0%	0.840	0.970	1.000	0.937	Accepted	0.937
FDM reinforcement:									
Tactical									
1	Sense of the ball	0.262	85.7%	0.671	0.829	0.914	0.805	Accepted	0.805
2	Sense of the ball and racket	0.201	85.7%	0.700	0.857	0.943	0.833	Accepted	0.833
3	Sense of the ball, racket and net	0.130	100.0%	0.700	0.871	0.971	0.848	Accepted	0.848
Technical									
1	The game begins	0.089	100.0%	0.729	0.900	0.986	0.871	Accepted	0.871
2	Drills	0.062	100.0%	0.843	0.971	1.000	0.938	Accepted	0.938
3	Play with conditions	0.075	100.0%	0.814	0.957	1.000	0.924	Accepted	0.924

Table 8 shows that experts concur on three categories of tactical component activities and three categories of technical component activities inside the proposed module. The expert panel positively evaluated tactical activities, including ball sense, ball and racket sense, and ball, racket, and net sense, while also expressing full support for technical activities such as the game begins, drills, and play with conditions. External experts corroborated these findings and underscored the significance of systematic training customized to individual physical requirements. A thorough examination of the theme concerning the primary components of the module is provided as illustrated in Table 9 below:

Table 9. Theme of activities based on the FDM analysis

No.	Item	Triangular Fuzzy Numbers		Fuzzy Evaluation Process				Consensus	Accepted Element
		d	%	m1	m2	m3	(A)		
FDM experts:									
1	let's get started	0.076	100.0%	0.800	0.950	1.000	0.917	Accepted	0.917
2	Let’s play	0.087	95.0%	0.780	0.935	0.995	0.903	Accepted	0.903
3	Let’s move forward	0.072	100.0%	0.750	0.920	0.995	0.888	Accepted	0.888
4	I win	0.076	100.0%	0.800	0.950	1.000	0.917	Accepted	0.917
FDM reinforcement:									
1	let's get started	0.062	100.0%	0.757	0.929	1.000	0.895	Accepted	0.895
2	Let’s play	0.089	100.0%	0.729	0.900	0.986	0.871	Accepted	0.871
3	Let’s move forward	0.089	100.0%	0.729	0.900	0.986	0.871	Accepted	0.871
4	I win	0.062	100.00%	0.757	0.929	1.000	0.895	Accepted	0.895

Overall, experts agree on all the activity themes, which include let's get started, let's play, let's move forward, and I win. This agreement is further reinforced by external experts, who accept the value of all activity themes corresponding to FDM experts. The absence of additional recommendations from experts indicates that the selection of activity themes by the researchers has met the expected needs and standards. This proves that the activities outlined by the researchers are comprehensive and suitable for achieving the module's objectives, thereby reflecting the quality and accuracy of their preparation. Subsequently, the analysis presents the results of the study's analysis for the activity duration, which were determined by expert consensus through the FDM method analysis as shown in table 10 below:

Table 10. Duration of activities based on the FDM analysis

No.	Item	Triangular Fuzzy Numbers		Fuzzy Evaluation Process				Consensus	Accepted Element
		d	%	m1	m2	m3	(A)		
FDM experts:									
1	3 minutes	0.493	25.00%	0.435	0.565	0.680	0.560	Not accepted	0.560
2	5 minutes	0.231	85.00%	0.640	0.810	0.925	0.792	Accepted	0.792
3	10 minutes	0.160	95.00%	0.700	0.865	0.960	0.842	Accepted	0.842
4	15 minutes	0.186	90.00%	0.650	0.825	0.940	0.805	Accepted	0.805
5	20 minutes	0.267	80.00%	0.640	0.805	0.905	0.783	Accepted	0.783
6	25 minutes	0.373	35.00%	0.505	0.670	0.805	0.660	Not accepted	0.660
7	30 minutes	0.453	25.00%	0.410	0.560	0.695	0.555	Not accepted	0.555
FDM reinforcement:									
1	3 minutes	0.441	28.6%	0.257	0.386	0.543	0.395	Not accepted	0.395
2	5 minutes	0.184	71.4%	0.586	0.771	0.914	0.757	Not accepted	0.757
3	10 minutes	0.116	100.0%	0.671	0.857	0.971	0.833	Accepted	0.833
4	15 minutes	0.141	100.0%	0.643	0.829	0.957	0.810	Accepted	0.810
5	20 minutes	0.130	100.0%	0.700	0.871	0.971	0.848	Accepted	0.848
6	25 minutes	0.270	71.43%	0.529	0.714	0.857	0.700	Not accepted	0.700
7	30 minutes	0.374	28.57%	0.500	0.671	0.800	0.657	Not accepted	0.657

FDM experts concur with the acceptance of the four proposed activity durations: 5 minutes, 10 minutes, 15 minutes, and 20 minutes. This finding is corroborated by FDM reinforcement experts, which was also subjected to three-time intervals: 10 minutes, 15 minutes, and 20 minutes. Experts indicate that certain activity durations are deemed inappropriate; specifically, a 3-minute duration is considered insufficient for effective engagement, whereas 25 and 30-minute durations are regarded as excessively lengthy for children's participation. Researchers must consider expert consensus when establishing a more suitable timeline for the development phase of the street tennis-based sports readiness module. Hence, table 11 presents the findings of the study analysis regarding the equipment, derived from expert consensus utilizing the FDM method as below:

Table 11. Activity equipment based on the FDM analysis

No.	Item	Triangular Fuzzy Numbers		Fuzzy Evaluation Process				Consensus	Accepted Element
		d	%	m1	m2	m3	(A)		
FDM experts:									
1	Racket	0.098	90.0%	0.820	0.950	0.990	0.920	Accepted	0.920
2	Net	0.117	100.0%	0.790	0.930	0.985	0.902	Accepted	0.902
3	Cone	0.194	85.0%	0.700	0.860	0.945	0.835	Accepted	0.835
4	Marker line	0.133	95.00%	0.720	0.885	0.970	0.858	Accepted	0.858
5	Marker	0.190	90.00%	0.690	0.855	0.945	0.830	Accepted	0.830

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6	Red Ball (Mini Tennis ball level 1)	0.118	95.00%	0.770	0.920	0.980	0.890	Accepted	0.890
7	Football ball	0.256	60.00%	0.560	0.745	0.880	0.728	Not accepted	0.728
8	Basketball ball	0.272	55.00%	0.550	0.735	0.870	0.718	Not accepted	0.718
FDM reinforcement:									
1	Racket	0.144	100.0%	0.729	0.886	0.971	0.862	Accepted	0.862
2	Net	0.130	100.0%	0.700	0.871	0.971	0.848	Accepted	0.848
3	Cone	0.256	71.4%	0.614	0.786	0.900	0.767	Not accepted	0.767
4	Marker line	0.208	85.71%	0.643	0.814	0.929	0.795	Accepted	0.795
5	Marker	0.307	42.86%	0.586	0.757	0.871	0.738	Not accepted	0.738
6	Stage 1 tennis balls. (Red Ball)	0.163	85.71%	0.729	0.886	0.957	0.857	Accepted	0.857
7	Soccer ball	0.270	71.43%	0.529	0.714	0.857	0.700	Not accepted	0.700
8	Basketball ball	0.270	71.43%	0.529	0.714	0.857	0.700	Not accepted	0.270

Overall, for the activity equipment, FDM experts agreed to accept the six proposed types of equipment, namely rackets, nets, cones, line markers, markers, and stage 1 tennis balls (red ball). This view is also supported by the FDM reinforcement experts who received four types of equipment, namely rackets, nets, marker lines, and stage 1 tennis balls (red ball). According to experts, other equipment such as soccer balls and basketball ball were rejected because both of these pieces of equipment are intended for sending and receiving activities, and the experts believe that stage 1 (red ball) tennis balls are more suitable and sufficient for use. Therefore, researchers need to consider expert consensus in selecting more suitable equipment for the development phase of this street tennis-based sports readiness module. The content of the module analysis is subsequently presented in Table 12, which is derived from expert consensus using the FDM method. The results are as follows:

Table 12. Content of the module based on the FDM analysis

No.	**Item**	**Triangular Fuzzy Numbers**		**Fuzzy Evaluation Process**				**Consensus**	**Accepted Element**
		d	**%**	**m1**	**m2**	**m3**	**(A)**		
FDM experts:									
1	Themes	0.101	100.0%	0.780	0.930	0.990	0.900	Accepted	0.900
2	Learning standards	0.101	100.0%	0.780	0.930	0.990	0.900	Accepted	0.900
3	Activity implementation processes	0.089	95.0%	0.800	0.945	0.995	0.913	Accepted	0.913
4	Main component activities	0.089	95.0%	0.790	0.940	0.995	0.908	Accepted	0.908
5	Type of skills	0.089	95.0%	0.790	0.940	0.995	0.908	Accepted	0.908
6	Equipment	0.103	90.0%	0.800	0.940	0.990	0.910	Accepted	0.910
7	Assessment	0.089	95.0%	0.790	0.940	0.995	0.908	Accepted	0.908
8	Activity appendices	0.147	95.0%	0.710	0.875	0.965	0.850	Accepted	0.850
9	Objectives	0.081	95.0%	0.830	0.960	0.995	0.928	Accepted	0.928
10	Activity durations	0.163	95.0%	0.730	0.885	0.960	0.858	Accepted	0.858
FDM reinforcement:									
1	Themes	0.089	100.0%	0.729	0.900	0.986	0.871	Accepted	0.871
2	Learning standards	0.107	100.0%	0.757	0.914	0.986	0.886	Accepted	0.886

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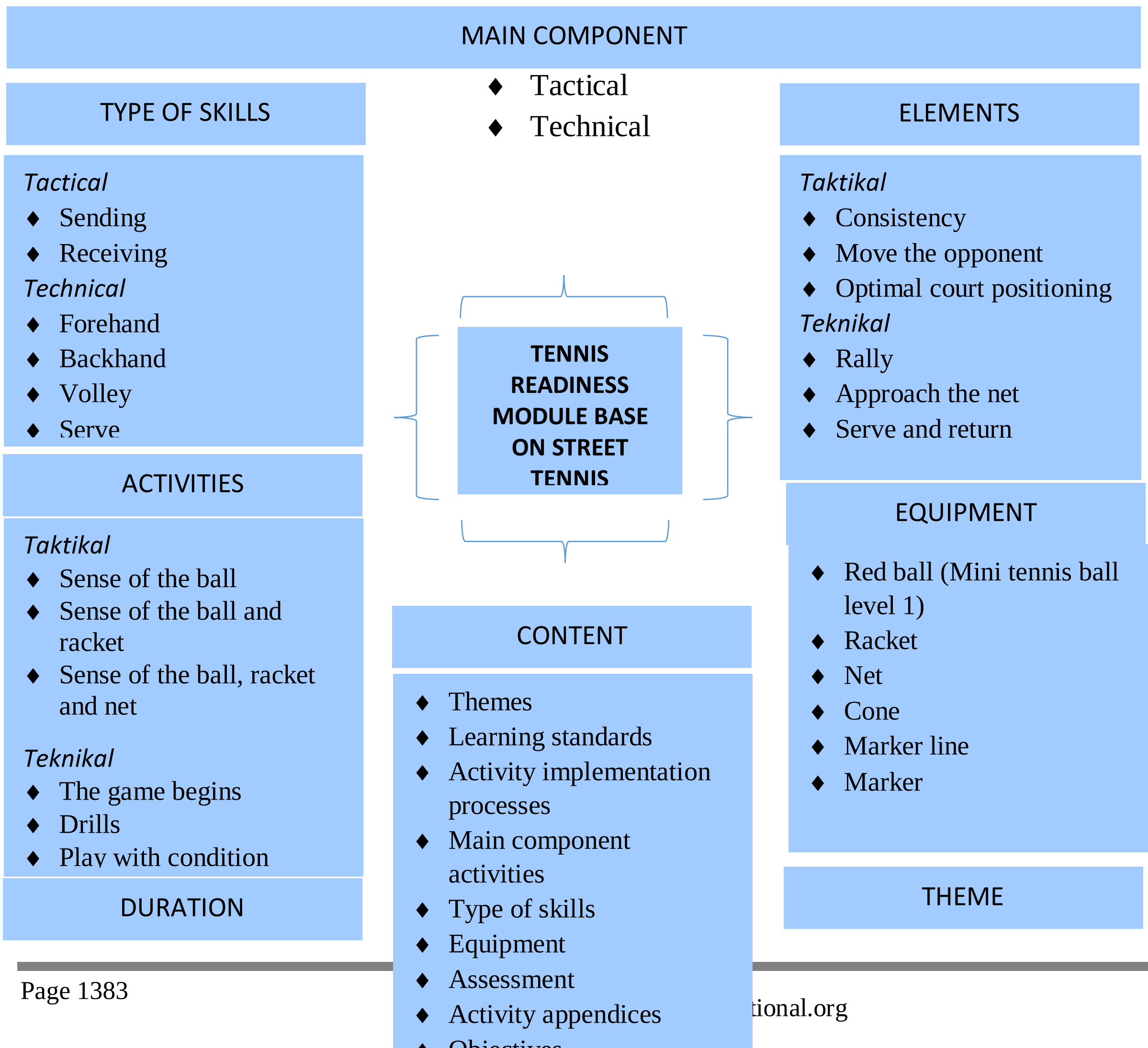
3	Activity implementation processes	0.089	100.0%	0.729	0.900	0.986	0.871	Accepted	0.871
4	Main component activities	0.089	100.0%	0.729	0.900	0.986	0.871	Accepted	0.871
5	Type of skills	0.107	100.0%	0.757	0.914	0.986	0.886	Accepted	0.886
6	Equipment	0.107	100.0%	0.757	0.914	0.986	0.886	Accepted	0.886
7	Assessment	0.107	100.0%	0.757	0.914	0.986	0.886	Accepted	0.886
8	Activity appendices	0.208	85.71%	0.643	0.814	0.929	0.795	Accepted	0.795
9	Objectives	0.111	85.71%	0.814	0.943	0.986	0.914	Accepted	0.914
10	Activity durations	0.258	85.71%	0.614	0.786	0.900	0.767	Accepted	0.767

In summary of the module content, there are ten module contents that received high approval ratings from FDM experts to be included in the street tennis-based sports readiness module, covering themes, learning standards, activity implementation processes, main component activities, types of skills, equipment, assessment, activity appendices, objectives, and activity durations. This approval is also supported by external experts who provided positive evaluations of all the main content module proposals, demonstrating strong consensus among all the involved experts. The results of this analysis indicate that the proposed module content is appropriate and acceptable as a basis for developing a tennis readiness module based on street tennis.

Formulation of the analysed data

Comprehensively, the results of the FDM analysis on the main components, elements, and key content of the module, the researchers produced a design diagram for a tennis readiness module base on street tennis.



- 5 minutes
- 10 minutes
- 15 minutes
- 20 minutes

- Let's get started
- Let's play
- Let's move forward
- I win

Figure 2. FDM analysis on the main components, elements, and key content of the module

CONCLUSIONS

This study introduces an innovative approach to teaching tennis to children, especially primary school students through a street tennis-based readiness module. This module offers practical solutions to physical constraints, such as the lack of courts, by utilizing limited space and easily available equipment like mini tennis balls. This approach allows students to learn the basics of tennis in any suitable space, making the integration of tennis into the co-curriculum easier and more cost-effective for various schools. With appropriate adaptations for limited space and a slower game pace, students can understand basic techniques while enhancing their enjoyment of playing tennis and providing a positive tennis learning experience despite facing court facility constraints.

Moreover, increasing access to tennis from an early stage can support talent development in this sport, foster healthy competition at the grassroots level, and expand the potential for discovering young talent. In addition, the participation of more children in this sport will make tennis more competitive and has the potential to drive the growth of the sports industry, including opportunities in coaching, equipment sales, and facility rentals. The design of this module can benefit coaches by providing structured training that can be customized without a real court. In addition, this study also provides references for developing other sports modules based on the street concept, especially for sports that have infrastructure constraints. Overall, this study contributes to the development of knowledge in sports education and enhances the competitive level of tennis globally.

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