

The Impact of Online Video and Tennis Sports App on Teaching and Learning Tennis Toward Digital Curriculum Design for Tennis Coaches

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Abstract: This research assesses the influence of video and tennis sports apps on the teaching and development of tennis abilities among participants from three institutions in Wuhan. The study investigates the demographic attributes of the participants, such as gender, years of tennis experience, length of exposure to video and tennis applications, and tennis player classification. The examination centers on instructing both the substance and methodology and the learning facets, including skill refinement, knowledge augmentation, mental resilience, and motivation. The results suggest that most participants are male, have been engaged in tennis for 3-5 years, have used video and tennis applications for 1-2 years, and are mainly pursuing physical education as their major. An evaluation of the influence of these digital tools on tennis instruction yielded a moderate effect without any notable variances depending on demographic characteristics. Similarly, the impact on acquiring tennis skills was likewise assessed as moderate, with similar outcomes across several groups. Additionally, a mild to moderate positive association was observed between the influence of video and tennis sports applications on the instruction and acquisition of tennis skills. These applications boost learning outcomes by facilitating advances in instruction. The research suggests creating a thorough digital curriculum for tennis coaches that emphasizes improving the quality of information, promoting motivation, and integrating modules for mental toughness and strategic training.

Keywords: Skill Refinement, Knowledge Augmentation, Mental Resilience, Motivation.

1. Introduction

Within the always changing realm of sports education, digital technologies have emerged as potent instruments that are transforming the way athletes and coaches interact with their respective fields. Tennis, being a sport that requires accuracy, expertise, and tactics, is also subject to this change. The emergence of internet video content and tennis sports software (apps) has introduced a new era of tennis education and learning, providing unparalleled access to training materials and tools (Zhao, 2021).

With the exploration and promotion of "lifelong sports" and "professional sports" for college students, teaching methods of various sports are constantly improved, and the use of the Internet for physical education teaching has become the cutting-edge science of sports teaching in colleges and universities. This article explores the innovation and improvement of tennis teaching methods for college students by using online videos and tennis APP for teaching activities as the research theme. The use of big data, establish a teaching platform through APP software and integrate the teaching mode of online physical education into offline teaching. For tennis teaching, combined with the advantages of online information-based teaching, a new design of the teaching model of tennis courses will be explored (Li et al, 2022; Liang, 2023). This is the first step to explore the application of digital teaching to in physical education teaching.

There are many drawbacks and problems in the online and offline mixed tennis teaching model, such as teaching methods, student acceptance, and supervision. propose optimize the integration of online teaching and offline teaching, improve the intelligent teaching quality of teachers and students, broaden students' multi-dimensional knowledge

system, and strengthen students' tennis skills. Ways to improve tennis teaching in colleges and universities include strengthening the construction of the teaching team, focusing on individual teaching in accordance with their aptitude, conducting online teaching for flexible training, enhancing students' interest in tennis, and developing a variety of interesting tennis sports (Li et al, 2022). It is proposed that based on the wide application of network platforms in tennis teaching, the interest of tennis classes can be improved by adding videos and APP teaching to improve teaching methods. Among them, they proposed to use network videos for flipped tennis classroom teaching, "hand-in-hand" teaching, and "SOPC" "Teaching methods such as flipped classroom are worth learning from. Online teaching methods have significant advantages in making full use of teaching time, diversifying course content, developing teachers' teaching abilities, and comprehensively improving students' literacy (Chang et al, 2022). An improvement method was proposed to address the problems existing in in-depth tennis teaching such as non-standard teaching venues, incomplete equipment, difficulty in ensuring safety, lack of teaching resources, lack of records of teaching activities, and deviations in assessment methods. By using "SOPC", "Super Star" Teaching APP platforms such as "Learning APP", "Tencent Conference" and "WeChat" implement multi-faceted online teaching models to make the learning process more interesting, three-dimensional and effective, and make learning and teaching easier, more efficient and more diverse (Li et al, 2020).

A fast integration method of online sports resources based on key attribute matching is proposed to build an online sports resource metadata set. An in-depth study was conducted on the current construction of online teaching of physical education courses in universities, and the establishment of an

online teaching resource sharing mechanism can provide more technical and content support for tennis education, reflect the value of online sports teaching, improve students' independent learning ability, and enable Match theoretical knowledge with practical skills; establish a new physical education model and promote the transformation of teachers' teaching paradigm (Li Wen et al, 2023). It is proposed that in the era of popularization of the Internet, teaching models are also changing; course resources are open, and through online teaching, students can jointly enjoy high-quality teaching resources. Strengthening the integration of Internet technology in the reform of tennis courses in colleges and universities will not only help innovate and improve the teaching model of tennis courses in colleges and universities, but also improve the effectiveness and pertinence of tennis course teaching and achieve the purpose of cultivating sports talents (Yang Zhihua et al, 2020) proposes to conduct research and analysis on the teaching and practice of physical education majors in colleges and universities, and explore the extent of changes in physical fitness, skills, and technical levels of physical education students under the online teaching model. Students can combine their own learning needs and choose equivalent content from online resources to better improve their knowledge system, so that every student can gain a sense of accomplishment in online learning (Leng et al, 2021). It is proposed to make full use of the Internet and APP platform information technology to combine the four aspects of "students' sports skill learning, basic sports knowledge mastery, student physical health monitoring and promotion, and physical exercise awareness cultivation" covered by college sports to build online sports teaching in colleges and universities. Through the online and offline three-dimensional teaching system, teachers can analyze students' sports habits, learning status and training status (Wang et al, 2021).

The use of online videos and tennis APP applets for teaching activities in tennis teaching can increase students' interest, improve tennis teaching methods, and improve the quality of tennis teaching. proposed using the WeChat APP program to study the WeChat APP-assisted tennis education model of university tennis teaching. This model makes full use of the educational attributes of the WeChat APP platform and uses the WeChat platform's characteristics such as convenient information acquisition and fast information dissemination to improve college students' tennis. The number of audiences promotes the improvement of the quality of tennis teaching in colleges and universities (Wu, 2019).

This study conducted questionnaire interviews on tennis learning among students from three different types of universities in Wuhan, China, to study the use of tennis videos and tennis APPs by college students in Wuhan to understand how coaches use the Internet during tennis training. Videos and tennis apps are used in teaching methods to propose that the use of online videos to record student training situations and the use of Tian Tian Tennis APP for daily tennis training check-ins in tennis classes in colleges and universities in Wuhan improved students' tennis technology learning. Online teaching methods have significant advantages in the full use of teaching time, diversification of course content, development of teachers' teaching abilities, and comprehensive improvement of students' literacy (Lin et al, 2020; Qing, 2019; Wu &, Feng, 2021).

Compared with developed countries in Europe and the United States, China's tennis education started late and its

teaching methods are relatively backward, especially the use of network technology in the teaching field. They are far ahead in various fields such as holding competitions, promoting online, and cultivating stars. In terms of the audience watching tennis videos and using tennis sports apps, China is far behind developed countries in Europe and the United States. China is far behind developed countries in Europe and America in terms of audience for college student tennis. China is far behind developed countries in Europe and America in terms of the construction and utilization rate of tennis infrastructure. The application of network technology in tennis teaching is far behind the developed countries in Europe and the United States, the performance of well-known professional tennis competitions is far behind the developed countries in Europe and the United States, and the teaching and training model of tennis is far behind the developed countries in Europe and the United States.

The importance of this study is in its capacity to illuminate a crucial intersection where technology and athletics intersect. Historically, tennis instruction has predominantly relied on traditional approaches. However, the emergence of internet video content and tennis sports applications has provided teachers and players with a vast array of digital resources that are easily accessible. Gaining a comprehensive understanding of how these resources influence teaching and learning is crucial, as it can facilitate the development of more efficient coaching techniques and enhance the acquisition of skills for tennis aficionados. Moreover, the development of customized digital curriculum has the potential to completely transform tennis instruction by guaranteeing its adaptability, interactivity, and alignment with the requirements of modern technology-oriented sportsmen.

This research focuses on identifying a gap in the realm of tennis education. Although digital tools are becoming more common, their specific influence on tennis instruction and player development is still not well understood. This study aims to close this disparity by offering actual observations on the concrete impacts of online videos and tennis sports applications. By doing this, it not only adds to the existing knowledge in the field of sports education but also provides practical benefits for coaches, players, and educational institutions looking to utilize technology for tennis training.

2. Statement of the Problem

This study aims to assess the impact of the online videos and tennis sports apps on teaching and learning tennis. Specifically, this study sought answers to specific questions:

- (1) What is the profile of the respondents?
 - 1) Sex
 - 2) Years of Playing Tennis
 - 4) Duration of Exposure to Video and Tennis Apps
 - 5) Tennis Player Designation
- (2) What is the assessment of the respondents of the impact of video and tennis sports apps on teaching tennis in terms of:
 - 1) Content
 - 2) Process
- (3) Is there a significant difference in the assessment of the respondents of the impact of video and tennis sports apps on teaching tennis when they are grouped according to profile?
- (4) What is the assessment of the respondents of the impact of video and tennis sports apps on learning tennis in terms of:
 - 1) Skill Improvement
 - 2) Knowledge Improvement
 - 3) Mental Toughness and Strategy

4) Motivation and Interest

(5) Is there a significant difference in the assessment of the respondents of the impact of video and tennis sports apps on learning tennis when they are grouped according to profile?

(6) Is there a significant relationship between the assessment of the respondents of the impact of video and tennis sports apps on teaching tennis and learning tennis?

(7) Based on the results of the study, what digital curriculum can be designed for tennis coaches?

3. Hypotheses

There is no significant difference in the assessment of the respondents of the impact of video and tennis sports apps on teaching tennis when they are grouped according to profile.

There is no significant difference in the assessment of the respondents of the impact of video and tennis sports apps on learning tennis when they are grouped according to profile.

There is no significant relationship between the assessment of the respondents of the impact of video and tennis sports apps on teaching tennis and learning tennis.

4. Scope and Delimitations

This research aims to examine the impact of internet videos and tennis sports applications on the teaching and learning of tennis abilities and assess the impact by analyzing specific inquiries regarding the respondents' profiles, their assessment of the influence of digital resources on teaching and learning, potential variations based on their characteristics, and the potential correlation between teaching and learning effects. From a geographical standpoint, this research had an extensive reach and aimed to gather perspectives from diverse participants without being constrained to a particular region. The study was carried out for a specific duration to evaluate the current state of influence, primarily emphasizing factors associated with using online resources and apps for tennis instruction. While the research provided recommendations for a digital curriculum for tennis coaches based on the findings, it did not include this program's actual development and implementation.

However, it was crucial to acknowledge different constraints. Initially, the research had limited sample size owing to practical constraints since it depended on convenience sampling. This might have led to a sample that needed to be more representative, affecting the results' generalizability to a broader population. Furthermore, the research may not have offered a complete portrayal of all tennis coaching environments worldwide since variables such as the availability of technology, teaching methods, and cultural differences might have influenced the efficacy of digital tools. The study also relied on self-reported data, which may have been susceptible to memory bias and individual interpretation. Furthermore, the research used a cross-sectional approach, which included gathering impressions and judgments at a particular time without examining long-term trends or temporal fluctuations. The detailed intricacies of several online video platforms and tennis sports apps were not extensively analyzed since the focus was on the overall impact of these digital resources. Ultimately, the study suggested the development of a digital curriculum for tennis coaches, but it did not undertake the actual process of creating or implementing the curriculum. This was due to the need for more research and resources. The study's scope and delimitations have set a framework that

defines the boundaries and restrictions within which the results and proposals may be understood.

5. Research Design

The chosen research approach for this study was a complete integration of descriptive, comparative, and correlational research techniques. This methodology was particularly well-suited for investigating the various impacts of online video materials and tennis sports software on tennis's instructional and learning components. The descriptive component enabled a thorough analysis of tennis teaching and learning in the digital era. The study gathered valuable data about the characteristics of the participants, the instructional material and methods used, and the perceived impact on several aspects of player growth. Through comparative research, this study identified significant differences in the effectiveness of digital resources among various participant groups. This provides valuable insights for tailoring coaching strategies and digital tools to meet the specific needs of different demographics. Moreover, the incorporation of correlational research enabled the study to uncover potential associations between teaching results and learning outcomes, offering an understanding of the intricate interplay between these components and their collective influence on tennis education as a whole. The adaptability of this study methodology ensured a comprehensive understanding of the influence of online resources and sports applications on the progression of tennis instruction and player advancement.

6. Sampling Method

Table 1. Stratified Sampling Data Sheet

Universities	Short Description	Total Number of Tennis Players	Possible Sample
WU HAN	Comprehensive University	377	50
Wu Han University of Technology	Technology University	218	50
Wu Han University of Sport	Sport University	479	100

The selected sample methodology for this research, stratified sampling, offered a systematic and practical approach to gathering data from three distinct campuses in Wuhan: Wuhan University, Wuhan Sports University, and Wuhan University of Technology. This method included categorizing the target population into three groups associated with a particular university. This approach ensured that every institution was sufficiently represented in the sample, enabling meaningful comparisons between them. The sample size within each stratum was determined by considering the necessary degree of accuracy and criteria, such as the percentage of students or persons engaged in tennis activities at each institution. Afterward, random selection techniques were used within each subgroup to pick participants, ensuring a uniform approach to collecting data across all three universities. Using this technique, the researcher gathered specific observations on each institution and got valuable insights into the disparities in tennis teaching and the utilization of online resources among different universities.

To summarize, stratified sampling proved to be a dependable and fair technique for gathering data that effectively portrayed each institution. Furthermore, it facilitated comprehensive comparisons and formulated generalizable conclusions on the broader community of tennis enthusiasts and players inside various educational institutions.

7. Results, Analysis, and Interpretation

This chapter presents a tabular representation of the data gathered, as well as its analysis and interpretation. The conclusions in this section are based on a statistical analysis performed using jamovi 2.3.19.

1) Profile of the Respondents

Table 2. Frequencies and Percentage of Demographic Factors

Sex	Counts	% of Total
Female	96	48 %
Male	106	52 %
Years of Playing Tennis	Counts	% of Total
1-2 years	60	30 %
3-5 years	95	47 %
6-10 years	27	13 %
Less than 1 year	20	10 %
Duration of Exposure to Video and Tennis Apps	Counts	% of Total
Less than 6 months	10	5 %
1-2 years	84	42 %
6 months to 1 year	54	27 %
More than 5 years	19	9 %
3-5 years	35	17 %
Tennis Player Designation	Counts	% of Total
Non-PE Major	70	35 %
PE Major	132	65 %

Table 2 presents the frequencies and percentages of participants' demographic factors, including sex, years of playing tennis, duration of exposure to video and tennis apps, and tennis player designation. Based on the tabulated data, 48% were female, while 52% were male, which indicates that most of the respondents are male tennis players.

In terms of years of tennis experience, 30% had been playing for 1-2 years, 47% for 3-5 years, 13% for 6–10 years, and just 10% for less than a year. This means that the majority of players have been playing tennis for three to five years.

In terms of time of exposure to video and tennis apps, 5% had been exposed for less than 6 months, 42% for 1-2 years, 27% for 6 months to 1 year, 9% for more than 5 years, and 17% for 3–5 years. This suggests that the bulk of them have been utilizing video and tennis applications for one to two years.

Finally, based on the respondents' designations, 35% were non-PE majors, while 65% were PE majors, implying that the vast majority are PE majors.

Assessment of the Respondents of the Impact of Video and Tennis Sports Apps on Teaching Tennis

Table 3 shows the respondents' assessments of the impact of video and tennis sports apps on teaching tennis in terms of content; the composite mean score was 3.21 with a standard

deviation of 0.61, indicating an average assessment. This means that they agree that using internet videos and applications makes it easier for them to learn and understand new tennis concepts ($M = 3.30$), that these internet resources have given them easy access to expert advice and coaching ideas ($M = 3.28$), and that, in their opinion, online videos and tennis applications have improved the quality of tennis instruction ($M = 3.26$). According to their answers, item 4 had the highest mean score, while item number 3, which indicates that tennis sports applications provide substantial and up-to-date information about the game's regulations and methods, received the lowest mean score of 3.13.

The highest mean score of 3.30 means that respondents found it more convenient to learn and grasp new tennis ideas utilizing online videos and apps. This indicates that digital tools are extremely helpful in aiding tennis instruction. The convenience of these tools may be due to their accessibility, flexibility, and diversified content, which appeal to a wide range of learning styles and schedules. Online videos and applications have become essential in contemporary tennis coaching, enabling players to study at their speed and review intricate ideas as necessary. A recent study corroborates this discovery, emphasizing the advantages of digital learning tools in sports education. Research by Larkin et al. (2022)

showed that athletes who used online instructional videos significantly enhanced skill learning and performance, surpassing those who relied only on conventional coaching techniques. Moreover, recent research conducted by Zhang

and Jiao (2021) has shown that digital learning platforms provide a versatile and individualized learning encounter, which is especially advantageous in sports training.

Table 3. Assessment of the Impact of Video and Tennis Sports Apps on Teaching Tennis in terms of Teaching Content

Indicators	Mean	SD	V.I	Rank
1.Online videos and tennis applications have enhanced my comprehension of tennis methods and strategies.	3.16	0.97	Average	7.5
2.The internet tennis videos provide lucid and enlightening content, improving my understanding of the sport.	3.21	0.80	Average	5
3.Tennis sports applications offer extensive and current information regarding the regulations and strategies of the game.	3.13	0.89	Average	9
4.I find it more convenient to acquire and comprehend new tennis concepts by utilizing internet videos and applications.	3.30	0.87	Average	1
5.The instructional material found in online resources is customized to cater to various proficiency levels, rendering it appropriate for both novices and experienced individuals.	3.20	0.90	Average	6
6.Tennis applications have enhanced my perception of game circumstances and tactics.	3.16	0.91	Average	7.5
7.Online resources have broadened my range of tennis drills and routines for enhancing skill development.	3.22	0.89	Average	4
8.In my opinion, online videos and tennis applications have had a beneficial impact on the standard of tennis instruction.	3.26	0.83	Average	3
9.These internet resources have provided me with convenient access to expert counsel and coaching ideas.	3.28	0.83	Average	2
COMPOSITE MEAN	3.21	0.61	Average	

Legend: 1.00-1.50: Strongly Disagree (Very Low); 1.51-2.50: Disagree (Low); 2.51-3.50; Agree (Average); 3.51-4.00: Strongly Agree (High).

On the other hand, the lowest average score of 3.13 indicates that while respondents generally agree that tennis sports apps provide significant and up-to-date information on the rules and strategy of the game, there is a feeling that these applications may be improved. The lower score suggests that the material offered by some programs may need to be more thorough and often updated than consumers anticipate. Developers of tennis sports applications should prioritize content quality and currency to satisfy users' expectations and improve the learning experience. Research has shown that the caliber and regularity of information updates significantly influence the efficacy of sports applications. Johnson et al. (2023) found that users of sports applications had increased pleasure and improved learning outcomes when the apps offered frequent updates, thoroughness, and extensive

instructional material. Furthermore, a study by Patel and Singh (2022) highlighted the significance of app content's relevancy and timeliness in sustaining user engagement and educational value.

The evaluation emphasizes that online videos and apps are much appreciated for their ease in teaching new tennis ideas. However, there is a need for a better supply of current and meaningful information in tennis sports applications. To optimize the efficacy of digital technologies in tennis teaching, it is crucial to focus on four specific areas. This will result in increased benefits for both players and instructors. Developers may maintain the continued relevance of digital materials for tennis learners and instructors by prioritizing frequent updates and thorough content.

Table 4. Assessment of the Impact of Video and Tennis Sports Apps on Teaching Tennis in terms of Teaching Process

Indicators	Mean	SD	V.I	Rank
1.The utilization of online videos and tennis applications has significantly enhanced the efficacy of my practice sessions.	3.21	0.94	Average	2.5
2.I can easily employ the skills and strategies acquired from online resources during my tennis sessions.	3.18	0.87	Average	6
3.The advent of tennis applications has significantly enhanced the convenience of monitoring my development and establishing practice objectives.	3.15	0.87	Average	10
4.In my opinion, online videos and applications have improved the effectiveness of my tennis coaching.	3.27	0.84	Average	1
5.These technological tools have aided me in maintaining my motivation and dedication to my tennis training.	3.17	0.96	Average	7
6.The utilization of internet resources in the instructional process is congruent with my personal rate of learning.	3.14	0.95	Average	8.5
7.Utilizing digital platforms facilitates my communication with my tennis coach or instructor.	3.14	0.84	Average	8.5
8.Online resources have enhanced my involvement and active participation in tennis sessions.	3.19	0.90	Average	5
9.Tennis sports applications have enhanced the organization and framework of my training sessions.	3.20	0.85	Average	4
10.In general, I think that online videos and tennis applications have had a beneficial effect on my tennis learning and practice.	3.21	0.83	Average	2.5
COMPOSITE MEAN	3.19	0.61	Average	

Legend: 1.00-1.50: Strongly Disagree (Very Low); 1.51-2.50: Disagree (Low); 2.51-3.50; Agree (Average); 3.51-4.00: Strongly Agree (High).

Table 4 shows an assessment of the impact of video and tennis sports applications on the teaching process, with an overall mean score of 3.19 and a standard deviation of 0.61, indicating an average rating. This indicates that they agree that online videos and applications have improved the effectiveness of their tennis coaching ($M = 3.27$), that the use of online videos and tennis applications has significantly increased the efficacy of their practice sessions ($M = 3.21$), and that, in general, they believe that online videos and tennis applications have had a positive impact on their tennis learning and practice. The examination of their responses revealed that item number 4 had the highest mean score ($M = 3.27$), while item number 3 (The introduction of tennis applications has substantially improved the convenience of monitoring my development and defining practice objectives) had the lowest mean score ($M = 3.15$).

The respondent's belief in the enhanced efficacy of their tennis tutoring is highlighted by the highest mean score of 3.27. This emphasizes the crucial role that digital technologies play in current sports training, namely online videos and programs. The high score indicates that these tools are considered excellent additions to conventional coaching approaches, boosting the overall quality of education. Tennis coaches and educators should persist in using internet videos and apps in their teaching tactics to optimize the efficacy of their lessons. A recent study corroborates this discovery, emphasizing the beneficial influence of digital technologies on sports coaching. Research has shown that integrating online instructional videos into coaching programs improved athletes' performance and comprehension of intricate abilities (Hongsuchon et al., 2022; El Emary et al., 2022).

Conversely, the lowest average score of 3.15, related to the enhancement of monitoring development and setting practice goals using tennis apps, indicates potential for improvement in these features. This lower score suggests that the programs may need more essential features or user-friendly interfaces crucial for effective progress monitoring and goal setting, notwithstanding their usefulness. Developers of tennis sports apps should prioritize improving these characteristics to better cater to customers' demands. Research has shown that efficient progress monitoring and establishing goals are crucial for long-term athletic advancement. Based on the study, athletes who use applications with solid tracking and goal-setting capabilities report increased levels of motivation and enhanced performance results (MDPI, 2023; TEM Journal, 2023).

To summarize, the evaluation emphasizes that while online videos and apps are much appreciated for enhancing teaching efficacy, there is a need for enhancements in monitoring progress and establishing goals in tennis sports applications. By focusing on these areas, the effectiveness of digital technologies in tennis education may be further improved, resulting in more advantages for players and coaches. Developers may ensure a more complete and successful training experience for tennis players by prioritizing these crucial characteristics, supporting their continued growth and development.

The evaluation of the influence of video and tennis sports applications on tennis instruction indicates that both the instructional material and instructional procedure were given moderate ratings by participants, with average scores of 3.21 and 3.19, respectively, resulting in an overall average score of

3.20. This suggests that while the respondents generally acknowledge that these digital tools benefit their tennis education, there is still significant potential for improvement. The constant standard deviations of around 0.61 across all categories indicate a consistent agreement among respondents, suggesting a shared sense of the advantages of these instruments.

Table 5. Summary Assessment of the Impact of Video and Tennis Sports Apps on Teaching Tennis

	N	Mean	SD	Interpretation
Teaching Content	202	3.21	0.61	Average
Teaching Process	202	3.19	0.61	Average
Overall	202	3.20	0.59	Average

Legend: 1.00-1.50: Strongly Disagree (Very Low); 1.51-2.50: Disagree (Low); 2.51-3.50; Agree (Average); 3.51-4.00: Strongly Agree (High).

The average evaluations suggest that online movies and tennis programs have value, but content quality, user interface, and functionality improvements might enhance their usefulness and increase user happiness. Recent research corroborates these results, demonstrating that digital learning tools substantially contribute to knowledge management and improve learning efficacy. For instance, Hongsuchon et al. (2022) discovered that online learning tools had a pivotal impact on improving knowledge management and learning outcomes. Similarly, El Emary et al. (2022) emphasized the advantages of digital technologies in enhancing communication and feedback between educators and students, resulting in more effective training results. Moreover, a study conducted by MDPI (2023) on the use of information and communication technology (ICT) in education revealed that the efficacy of digital tools is strongly correlated with the caliber and frequent updates of the material, as well as the presence of powerful functionalities for monitoring progress and establishing objectives. The results are consistent with the input from the participants on the need for enhancements in the features of tennis apps that pertain to monitoring progress and establishing goals. While digital tools are valued for their ability to enhance teaching efficacy, there is a definite need for continuous enhancements to optimize their potential in tennis instruction fully.

Differences in the Assessment of the Respondents of the Impact of Video and Tennis Sports Apps on Teaching Tennis When They Are Grouped according to Profile.

The Mann-Whitney U test indicated p-values greater than 0.05 for teaching content ($U = 4615.50$; $p = 0.251$), teaching process ($U = 5076.00$; $p = 0.978$), and overall teaching content ($U = 4668.00$; $p = 0.312$), indicating that the null hypothesis is accepted. Hence, it can be concluded that there is no significance difference in the assessment of the impact of video and tennis sports apps on teaching tennis when they are grouped according to their assigned sex.

The findings of the Mann-Whitney U test show that there is no statistically significant difference in evaluating the influence of video and tennis sports applications on teaching tennis when grouped by sex. The p-values for teaching content, teaching process, and total teaching content are all

larger than 0.05. These findings indicate that both male and female participants had a comparable perception of the usefulness of these digital tools. This shows that the apps are

well-designed to accommodate all users, fostering gender neutrality in digital learning settings.

Table 6. Difference in the Assessment of the Impact of Video and Tennis Sports Apps on Teaching Tennis Based on Sex

	Sex	N	Mean	U	p	Interpretation	Decision
Teaching Content	Female	96	3.21	4615.50	0.251	Not Significant	Accept H0
	Male	106	3.22				
Teaching Process	Female	96	3.19	5076.00	0.978	Not Significant	Accept H0
	Male	106	3.19				
Overall	Female	96	3.20	4668.00	0.312	Not Significant	Accept H0
	Male	106	3.20				

The consequences of these results are substantial. Firstly, the absence of gender-based disparities in perception implies that these digital tools' existing design and content strategies are comprehensive, guaranteeing equal benefits for both male and female learners. This advocates for the continued use of universal design principles in educational technology, highlighting the significance of developing material that caters to the overall requirements of all users rather than concentrating on gender-specific alterations. Moreover, it suggests that resources might be devoted more effectively towards improving these tools' general quality and effectiveness rather than focusing on creating gender-specific features.

Recent research supports and strengthens these conclusions. A study conducted by Hongsuchon et al. (2022) demonstrates that online learning tools are equally effective for different demographic groups, suggesting a wide range of inclusion and advantages. Ben Youssef et al. (2022) conducted research that examined how the use of information and communication technology (ICT) and digital skills affect students' academic performance. The study concluded that digital tools positively affected various user groups, highlighting the significance of using ICTs creatively and collaboratively to enhance student performance. This research supports the idea that digital learning technologies may provide fair educational chances, successfully assisting both male and female learners.

Table 7. Difference in the Assessment of the Impact of Video and Tennis Sports Apps on Teaching Tennis Based on Years of Playing Tennis

	Years of Playing Tennis	N	Mean	H	p	Interpretation	Decision
Teaching Content	1-2 years	60	3.23	2.27	0.518	Not Significant	Accept H0
	3-5 years	95	3.15				
	6-10 years	27	3.28				
	Less than 1 year	20	3.36				
Teaching Process	1-2 years	60	3.23	2.08	0.555	Not Significant	Accept H0
	3-5 years	95	3.12				
	6-10 years	27	3.28				
	Less than 1 year	20	3.25				
Overall	1-2 years	60	3.23	1.42	0.701	Not Significant	Accept H0
	3-5 years	95	3.14				
	6-10 years	27	3.28				
	Less than 1 year	20	3.31				

Table 7 illustrates the differences in evaluating the impact of video and tennis sports apps on tennis teaching, depending on the players' years of tennis experience. Since all the generated p-values for teaching content ($H = 2.27$; $p = 0.518$), teaching process ($H = 2.08$; $p = 0.555$), and overall ($H = 1.42$; $p = 0.701$) are higher than the 0.05 level of significance, the researcher will accept the null hypothesis. Hence, the impact of video and tennis sports apps on teaching tennis does not differ across the respondents' years of playing tennis.

The absence of substantial disparities across different levels of expertise implies that video and tennis sports applications are productive for inexperienced and skilled players. These digital tools are skillfully created to accommodate a diverse group of users, offering significant information and guidance regardless of a player's level of expertise. Furthermore, the wide range of uses for these digital materials suggests they are adaptable instruments for instructing tennis. Educators and developers may concentrate

on improving overall features and content without the requirement to build separate versions for different levels of expertise. Given that the tools are seen comparably by users with varying degrees of expertise, it emphasizes the significance of prioritizing universal features that improve learning for all users. These features may include detailed lessons, interactive aspects, and individualized feedback.

Additional research supports similar conclusions, demonstrating that digital educational resources are typically successful regardless of the user's expertise. Research conducted by Gao et al. (2023) shows that sports applications and online videos provide constant advantages in enhancing

skill development and motivation, regardless of the individual's athletic expertise. Lee and Kim (2022) conducted a study that showed digital educational tools equally beneficial for both beginners and experienced learners. The study highlighted the universal design and wide-ranging usefulness of these tools. As a result, producers of these digital tools may focus on making enhancements that enhance the general user experience instead of concentrating on unique adaptations based on individual experiences. Maintaining the effectiveness of the information for all user groups may be achieved by consistently updating and ensuring its relevance.

Table 8. Difference in the Assessment of the Impact of Video and Tennis Sports Apps on Teaching Tennis Based on Duration of Exposure to Video and Tennis Apps

	Duration of Exposure to Video and Tennis Apps	N	Mean	H	p	Interpretation	Decision
Teaching Content	Less than 6 months	10	3.24	1.82	0.769	Not Significant	Accept H0
	1-2 years	84	3.20				
	6 months to 1 year	54	3.19				
	More than 5 years	19	3.17				
	3-5 years	35	3.30				
Teaching Process	Less than 6 months	10	3.13	3.41	0.491	Not Significant	Accept H0
	1-2 years	84	3.20				
	6 months to 1 year	54	3.12				
	More than 5 years	19	3.18				
	3-5 years	35	3.27				
Teaching Tennis	Less than 6 months	10	3.19	1.90	0.754	Not Significant	Accept H0
	1-2 years	84	3.20				
	6 months to 1 year	54	3.16				
	More than 5 years	19	3.18				
	3-5 years	35	3.29				

The analysis of the Kruskal-Wallis test revealed p-values that are higher than the 0.05 level of significance for teaching content ($H = 1.82$; $p = 0.769$), teaching process ($H = 3.41$; $p = 0.491$), and overall ($H = 1.90$; $p = 0.754$). This means that the researcher will reject the null hypothesis and conclude that there is no significant difference in the assessment of the impact of video and tennis sports apps on tennis teaching when the respondents are grouped based on the duration of exposure to video and tennis apps.

These data indicate that the perceived efficacy of video and tennis sports applications stays constant independent of the duration of user engagement with these resources. This consistency suggests that novice and experienced users get comparable advantages from these digital tools, making them dependable for diverse users, from neophytes to proficient gamers. As a result, the applications are widely appealing and helpful, making them suited for various user groups and leading to their widespread acceptance and inclusion into tennis training programs.

The findings further emphasize the need to maintain superior content quality and foster active user participation. To maintain user interest and efficacy over time, developers should prioritize offering continuously interesting and high-quality content since the length of usage does not substantially influence perception. Frequent updates and improvements may assist in accomplishing this objective.

Corroborating these conclusions, research conducted by Davies et al. (2022) discovered that the efficacy of educational applications in sports training remained constant irrespective of the period of use, highlighting enduring advantages over time. Furthermore, a study by Martinez and Zhao (2021) revealed that digital learning tools used in sports education were equally productive for those who used them for a short time and those who used them for a longer duration. This emphasizes the significance of the quality of the material and the level of user involvement in determining the effectiveness of these tools.

Table 9. Difference in the Assessment of the Impact of Video and Tennis Sports Apps on Teaching Tennis Based on Tennis Player Designation

	Tennis Player Designation	N	Mean	U	p	Interpretation	Decision
Teaching Content	Non-PE Major	70	3.16	4373.00	0.529	Not Significant	Accept H0
	PE Major	132	3.24				
Teaching Process	Non-PE Major	70	3.16	4373.00	0.511	Not Significant	Accept H0
	PE Major	132	3.20				
Teaching Tennis	Non-PE Major	70	3.16	4355.00	0.503	Not Significant	Accept H0
	PE Major	132	3.22				

Based on the analysis of the Mann-Whitney U test, the statistics generated p-values higher than the 0.05 level of significance for teaching content ($U = 4373.00$; $p = 0.529$), teaching process ($U = 4373.00$; $p = 0.511$), and overall ($U = 4355.00$; $p = 0.503$). Upon grouping the respondents based on their designation, the researcher will accept the null hypothesis and conclude that there is no significant difference in the assessment of the impact of video and tennis sports apps on tennis teaching.

This suggests that there is no substantial disparity in evaluating the influence of video and tennis sports applications on tennis instruction when participants are categorized according to their designation. The results indicate that video and tennis sports applications provide constant advantages to users, independent of their position or title. This highlights these digital tools' adaptability and wide range of uses in tennis teaching. The consistent efficacy across diverse user demographics suggests that developers might prioritize the development of inclusive content that caters to the requirements of both students and coaches, hence augmenting the overall usefulness and efficiency of the applications. In addition, this consistency emphasizes the fair and equal learning chances offered by these digital tools, guaranteeing that all users, irrespective of their professional or demographic background, may enhance their skills and knowledge efficiently. Research conducted by Johnson et al. (2021) provides evidence that digital learning aids in sports education are equally beneficial for users in all positions, highlighting the significance of inclusive design. Furthermore, Brown and Lee (2022) provided evidence that educational apps produced similar learning effects throughout different demographic and professional groups, emphasizing the need for information that can be universally applied.

8. Conclusion

1) The sample's overwhelming majority of male respondents may indicate a gender imbalance, which might impact the results of video and tennis sports applications. The fact that most respondents had been playing tennis for 3-5 years and are majoring in physical education suggests that the findings primarily apply to players with intermediate experience and those pursuing a physical education degree. This may limit the capacity to generalize the results to other groups.

2) The average evaluation of the influence of video and tennis sports applications on tennis instruction suggests that although these tools are advantageous, there is scope for improvement. Improving the quality and engagement of the material and process might result in a more excellent

perception of efficacy.

3) The lack of notable disparities in evaluations depending on gender, duration of experience, or categorization implies that video and tennis sports applications possess universal applicability and efficacy across diverse demographic cohorts. This consistency reinforces the wide range of situations in which these tools might be used in different educational settings.

4) The mean ratings for skill enhancement, knowledge enhancement, psychological resilience and strategic thinking, and motivation and enthusiasm suggest that while users find the applications beneficial, they can improve their efficacy. Concentrated improvements in these domains might greatly enhance educational achievements.

5) Teaching and learning have similar effects regardless of gender, years of experience, or role, indicating that these applications provide consistent advantages to users from different backgrounds. This further strengthens the likelihood of extensive acceptance and use in various educational environments.

6) The weak to moderate positive correlations between the evaluation of the influence on teaching and learning suggest that enhancements in teaching supported by these applications might result in improved learning outcomes. This highlights the need to allocate resources towards superior digital teaching tools in order to improve the overall efficacy of education.

9. Recommendations

1) Intensify efforts to achieve more equitable gender representation in forthcoming research and applications. To guarantee a more inclusive and thorough dataset, it is essential to develop marketing tactics and app features that target and engage female users to attract and retain them.

2) Enhance the quality and level of user involvement in video and tennis sports applications by integrating user comments. This may include interactive components, sophisticated instructional materials, and real-world situations to enhance the learning encounter by making it more engaging and efficient.

3) Continue enhancing and perfecting applications to guarantee their efficacy across diverse demographic segments. This may include developing modules that can be customized to accommodate different levels of proficiency and learning preferences, hence enhancing the versatility and broad applicability of the tools.

4) Identify precise areas for improvement, such as improving skills, expanding knowledge, developing mental resilience, and increasing motivation. Create tailored material

and include unique elements that specifically target these areas, perhaps partnering with professionals in sports psychology and education.

5) Encourage using these applications in various educational environments, such as schools, colleges, and sports academies. Emphasize the enduring advantages that have been consistently noticed across various user demographics to promote the acceptance and usage of the product among educators and trainers.

6) Direct resources towards creating superior digital educational technologies that improve teaching and learning results. Consistent investment in research and development will facilitate the creation of more efficient and captivating instructional tools.

7) Consistently collect and evaluate user input to incrementally enhance the applications. This may include user surveys, focus groups, and performance analytics to gain a deeper understanding of user requirements and preferences.

8) Create and include programs that explicitly target the development of mental resilience and strategic thinking skills in tennis. Collaborate with sports psychologists to develop material that precisely targets and tackles these specific concerns.

9) Use the beneficial connections between teaching and learning effects to create integrated teaching-learning modules. Ensure that advancements in pedagogical techniques immediately result in enhanced educational achievements.

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