



Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Tennis computer-assisted teaching effects experimental research based on SPSS statistics analysis

Dezhi Zhang^{1*} and Shuang Wang²

¹Physical Education Department, Xi'an University of Architecture and Technology, Xi'an, China

²Physical Education Department, Hebei Normal University of Science and Technology, Qinhuangdao, China

ABSTRACT

Modern teaching theory has already penetrated into each discipline teaching, many physical education teachers also take it as guidance; while computer-assisted teaching possesses interesting features with its own special functions, and it has great worth in concentrating students' attentions and stimulating their motions. In order to improve tennis teaching quality and propel tennis education reform, this paper designs 3 months total 24 courses computer-assisted teaching experiments according to tennis teaching features and objectives so as to explore computer-assisted teaching advantages which over that of traditional teaching through data generated before and after experiment as well as during experiment process, and provide theoretical basis for tennis education reform. In this paper, firstly state modern physical education objects transferring direction and tennis education features, then analyze tennis forehand strokes technical features, finally verify such teaching method advantages by comparing with traditional teaching through computer-assisted teaching experiment design, experimental data and experimental result based on SPSS statistic analysis.

Key words: Computer-assisted teaching, SPSS statistics software, normal distribution, tennis education

INTRODUCTION

After entering into 21st century, people's living quality has been greatly improved. Sports has already become one part of life, entertainment sports weight has been increasing, sports and lifelong sports has been further combined. Sports event learning during university mainly is transferred to life sports, entertainment sports and cultural sports these aspects. Tennis as one of the seldom access lifelong sports event in middle school stage, its education has some problems. So as to propel the sport development, this paper makes research on tennis teaching objectives, modern tennis teaching model as well as its combination with computer-assisted teaching to explore tennis education reform directions through research process and result in the paper.

For research of combined tennis teaching with computer-assisted teaching, many people have made efforts; their teaching ideas and experimental result continuously propel tennis teaching as well as other physical education modernization development. Among them, Tong Yan-Hua Makes research on traditional tennis teaching and "static& dynamic combination" teaching method as well as teaching effects with high university 6 groups students in tennis selective course in 2011, and gets that adopts "static & dynamic combination" teaching method not only can improve initial tennis learning students learning efficiency, hitting success rate and motions normalization, but also can reduce teachers teaching workload [1]; Wang Hao Implementation of education reform by social development, apply exploring teaching model to improve students positivist and creative ideas, and analysis its application in tennis teaching[2]; Kong Xin-Liang According to computer-assisted teaching theory and its method application in tennis teaching content design as well as schedule arrangements, provides theoretical basis for optimizing tennis teaching structure through contrast analysis research on experimental results between traditional teaching method and computer-assisted teaching [3].

This paper based on previous analysis, makes research on integrating points of modern tennis teaching objectives and computer-assisted teaching, and designs 3 months 24 courses teaching experiments so as to explore computer-assisted teaching's rationality in tennis teaching application.

TENNIS TEACHING FEATURES ANALYSIS AND TEACHING SCHEME DESIGN

It is need to cultivate students' sport consciousness in middle school stage and enable them to have great improvement from interests to consciousness degree; while sports has been development towards life sports, entertainment sports ,pleasant sports and cultural sports in university stage. Regular access to and long time go in for sports in learning life is the important significance for life sports, some strong competitiveness sport events are hardly accessed to when students graduated from school, however, sports as badminton, basketball , Ping-pong ,tennis and so on that can still be regular engaged in which become favorite events to university students. This research analyzes tennis teaching features and tennis teaching experiment design so as to provide theoretical basis for university student tennis teaching through analysis result.

Problems put forward

First task for school teaching activities is to cultivate student self-learning ability and creative talent. Transfer teaching importance into first task, improve teaching efficiency with school as unit, make students the master of learning, realize learning individualization, let teachers fully play student learning leading role, first task reflects modern learning process objective law. Cultivate student self-learning ability and develop their creative talent is the basic guarantee to improve teaching quality that is the start point and end-result of school education reform [4].

Tennis course is one of the important courses in normal university physical education teaching, its specialty reflects that most of students never access to it in middle school stages, which occurs to incoherent exercising times in tennis course in case itself has less group hour, causing student trained technical motions cannot be defined. Comparing with other sports special events, tennis has remarkable difference that is many people participated while court seriously insufficient. Besides, student physical quality, psychological quality, coordinate ability and technical motions all have great differences, these differences indicate in the three aspects as following.

- Different students have different physical quality and sports event development speeds and levels under same request, teaching examples reflect in students' different learning schedule that generated by their different physical quality under same course hour and same assessment criteria.
- Same student shows different ability with different physical quality and sports events, teaching examples shows that when students are learning hitting, in seizing hitting points and sport trajectory of ball, students that previously touched ball easily master the techniques while students without playing experiences find it difficult to get the feeling of hitting;
- In traditional tennis teaching, it applies the teaching pattern from explain, demonstrate, whole group exercise, tour guide to summarize and evaluation. Though the pattern brings into positive significance to teaching, its teaching pattern is too single that its organization form is rigid.

Based on above traditional tennis teaching shortcomings, this paper puts forward one teaching pattern as computer-assisted teaching, the pattern is the multimedia teaching that has been appeared as earliest as 1980s, while computer technology has gotten rapidly development and prevailed in 1990s, multimedia computer has already replaced previous multiple teaching medias in comprehensive using ,therefore common mentioned multimedia teaching specially refers to teaching activities process by utilizing multimedia computer and with the support of prepared multimedia teaching software beforehand, which is called as computer-assisted teaching (CAT). To enrich tennis teaching pattern and obtain improvement of teaching effect, it is need to explore the merits between computer-assisted teaching and traditional 5 segments teaching method and design teaching experiments according to tennis teaching features and teaching objectives, so that can get computer-assisted teaching advantages and tennis teaching pattern reform directions through analysis of teaching experiment result [5].

Modern tennis teaching features and tennis forehand strokes motion analysis

The content that modern tennis teaching pattern theory highlights is define student dominant position in teaching activities, clearly advocate establish "teaching" on the basis of "learning", in the meanwhile of teaching method improvement, implement effective guidance and cultivate on students learning methods through all ways. Therefore, in tennis teaching methods, modern tennis teaching theory and method has experienced transplanting modern teaching reflection theory into tennis teaching theory, transplanting practices into practices, make organic combination using of flexible and diverse tennis teaching method with multiple ways. Presently more popular tennis teaching methods and teaching patterns are mainly tennis programmed teaching, tennis pattern teaching, tennis hierarchy teaching and computer-assisted teaching such 5 methods.

Multimedia system is used in multi sensorial media; learning through multi sensory is more conform to human learning recognition law. Sports techniques has 3 D space tour movement trajectory, Sports technical motions including features as continuity, complexity, particularity and multiple linkage. While in demonstration process, it is impossible for teachers to make static or freeze continuously and inseparable sports technical motions, which causes students find difficult to carefully observe and understand sports technical motions whole process. The most practical method to solve the contraction is use multimedia technology in teaching; strengthen students' observation and understanding of sports technical motions. Basic tasks for modern education is training the creative talents of comprehensive development, its core is cultivating students' capacity for independent innovation, finally make students "learn to create" and "learn to learn". Computer-assisted teaching is most helpful for student to keep sports knowledge and improve teaching efficiency.

Backswing, when the stage starts , upper limbs should bent as much as possible that enable body shifts in the inside direction of service line, then quadriceps femora's makes flexion and extension so as to reduce sports speed and store elastic potential energy,the elastic potential energy may partial release so as to assist sportsman fast moving to ball direction; Backswing may have lots of different forms .In modern multiuse hitting or western fore hand, usually takes foot as supporting point, when elbow move backwards meanwhile rotate shoulder so that can remain racket point to coming ball; When lift elbow, forearm style racket rotates with supporting point of elbow and shoulder, racket face kicks downwards, whole racket or arms rotations is more remarkable by comparing with shoulder rotation and at the time withdraw racket techniques.

Circuit is main feature of backswing, it increases tempo when hitting and a big angular rotation that shoulder starts from ready point by comparing with gently backswing, convention of angle measurement are usually in four conditions as following.

- Upper limbs and lower limbs rotation angle are respectively expressed with changes of two lines included angle between shoulders and hip.
- Trunk and hitting arms included angle represents shoulder movement;
- Upper arm and forearm leading angle shows elbow movements;
- Wrist movements are represented by hand and forearm rear angle.

Forward swing racket and hit the ball, body rotation and lower limb extension make racket move forward and propel shoulder to move upwards and forward when hitting.

Racket trajectory, angle and speed are three mechanical factors that should be taken into consideration to succeed hitting. When racket face is vertical to court or pull racket at 10 degree and prepare for forehand hitting, racket trajectory have great changes before and after hitting, Table 1 shows angles that racket forms to ground conditions in flat hitting, top spin hitting and top spin slowing .

Table1: Table of racket angles before and after 3 kinds of hitting

Hitting way	Before hitting	After hitting
Flat hitting	35°	50°
Top spin hitting	35°	50°
Top spin slowing	50°	70°

Comparing with flat hitting, earlier fast embrace ball before hitting and in early stage of follow through should be done during top spin hitting, or in hitting , reduce racket speed in forward direction and increase racket speed in upward direction, follow through is in the stage after hitting; When players shift location and make preparation for next hitting, upper limbs gradually get slower, upper limbs largely internal rotation before and after hitting usually means follow through is across one side of body. From the perspective of technical analysis, when coach corrects players' one item technique, its location in train court is very important.

Tennis teaching experiment design

Research objects: 120 people in tennis introductory group in one university by random selection, and divide them evenly into 2 groups that are respectively control group and experimental group.

Experimental equipments: video, computer and SPSS statistic software.

Experiment time: 3 months (12 weeks).

Research method: Document literature, investigation method, questionnaire method, mathematical statistics method, logical reasoning method, teaching experiment method and contrast analysis method.

Tennis teaching experiment design: Make contrast teaching on student serve technical motion with computer and video, it exactly is utilize video to take in world excellent professional players' technical motion pictures and typical students' technical motion pictures in teaching group, apply Media player Group and Real player these two players in computer than enable two pictures show on one interface in the same time, it can be obviously seen the difference among motions through observing two kinds of contrasting motions.

TEACHING EXPERIMENT RESULT BASED ON SPSS STATISTICAL ANALYSIS

Before and after experiment tennis exercising diagnostic evaluation statistical result analysis

Before computer-assisted teaching experiment starting, make diagnostic evaluation of experimental group students motives in attending tennis exercising so as to make teachers carry out targeted teaching in multimedia computer-assisted teaching environment, then implement diagnostic evaluation on students motives in attending tennis exercising after experiment, the result as Table 2 shows.

Table 2: Table of Tennis exercising learning motives diagnostic evaluation result before experiment and after participating

Learning motives		A	B	C	D	E	F	G	H	I
Number of people	Before experiment	46	22	16	10	8	8	6	2	2
	After experiment	0	24	16	34	4	12	6	18	6
Proportion	Before experiment	38.3%	18.3%	13.3%	8.30%	6.70%	6.70%	5.00%	1.70%	1.70%
	After experiment	0.00%	20.0%	1.30%	28.3%	3.30%	10.0%	5.00%	15.0%	5.00%
Sequence	Before experiment	1	2	3	4	5	6	7	8	9
	After experiment	9	2	4	1	8	5	7	3	6

Note: From A to I are respectively indicating as for testing, learning a skill, tempering willpower, one fashion, beauty body shape, fun and interesting, can improve one's sport level, can indicate one's skill and ability.

From Table 2, it can be known that before teaching experiment around 70.4% students are short of positive learning motives that regard test as the main motives, which indicates before experiment students have really recognize tennis fitness value. If it not be corrected, teaching effects would be greatly affected. Therefore, teachers should use positive way to guide students so as to make them clear about learning purpose and get rid of negative motives. However, through investigation result after computer-assisted teaching experiment, it can be seen that students have re-examined tennis fitness and heart health functions, which not only eliminate student tennis function, but also cultivate and consolidate student positive motives, stimulate student interests to tennis and improve tennis exercising motives.

Before experiment experimental group and control group two groups students forehand stroke motion levels diagnostic evaluation results is as Table 3 shows.

Table 3: Table of two group students before experiment tennis technical level diagnostic evaluation result

Mechanical elements	A	B	C	D	E	F	Average value	Significant difference
Experimental group	12	18	16	6	4	4	30.67	$P > 0.05$
Control group	11	20	15	7	3	4	30.25	

Note: From A to F are respectively representing balance, start point in forward swing, start point in backward swing, racket trajectory with leg grounding motion, forearm internal rotation motion and racket ending motion.

Data in Table 3 shows that experimental group and control group basically stay the same in forehand stroke ability, two group students tennis level have no significant difference, therefore no student quality influences on teaching effect during experiment process.

Motion teaching sequence is not definitely the motion structure sequence features, while it should guide by cognitive psychological features. The effect of tennis forehand stroke technical motion firstly is up to motion posture, therefore form into good motion posture is basic requirement of tennis technical teaching, cognitive psychology thinks that motion techniques forming firstly is vision dominates, and then transitionally change into kinesthesia control takes the principal. To verify motion teaching sequence influences on student motion presentation, function forming, Table 4 shows experimental group and control group scores condition in description of motions, from which each indicator full score is 10 scores, when description is fully correct then get 10 score, the maximum error in description get 0 score.

Table 4: Table of students' motion description evaluation result comparison

indicator content	average value of experimental group	average value of control group	Significant difference
Balance description	7.5 ± 0.6	7.4 ± 0.8	$P > 0.05$
Forward swing racket starting point description	8.6 ± 0.8	6.4 ± 0.7	$P < 0.01$
Backward swing racket starting point description	8.3 ± 0.6	7.7 ± 0.7	$P < 0.05$
Right leg grounding motion racket trajectory description	8.9 ± 0.7	8.7 ± 0.9	$P > 0.05$
Forearm internal rotation motion description	8.1 ± 0.8	7.9 ± 0.6	$P > 0.05$
Racket technical motion description	8.6 ± 0.9	7.3 ± 0.4	$P < 0.01$
Error value between subjectivity and actual	8.7 ± 0.7	7.8 ± 0.8	$P < 0.05$

Experimental group and control group students mistake motions times' investigation contrast conditions in exercising are as Table 5 shows.

Table 5: Two group students' mistake motions times' investigation result contrasting table

Motion indicator	Experimental group	Control group	Difference	Significant difference
Forehand stroke	4.5 ± 1.26	4.71 ± 1.73	0.66 ± 0.47	$P < 0.05$

Data in Table 5 shows experimental group and control group students have significant difference in the aspect of mistake motions times, it reflects that experimental group students have more thorough understanding of motions in tennis teaching process.

Computer-assisted teaching quality evaluation result

Physical education course density is called comprehensive density; it refers to proportion that each teaching activity reasonable applying time covers total course time in course as well as time proportion among each activity. Due to course activity forms are different, measurement of course training density according to different activity items features can be divided into student training time, teacher guiding time, teacher observing and helping time, teacher organizational measure time, rest time and unreasonable time such 5 items. In multimedia computer-assisted teaching process, successively teaching new courses to experimental group and control group by random selection, evaluation its conformity according to above 5 kinds of time indicators, course density statistics and chart steps are as following 4 steps.

STEP1 Add each activity practice, such as teacher explanation, demonstration and individual guidance etc.

STEP2 Divide one course time into seconds, total 5400 seconds.

STEP3 Calculate one item consumed time and total course time proportion;

STEP4 According to proportions that calculated, get statistic check list through SPSS.

In computer-assisted teaching process, each activity proportion of experimental group and control group are as Table 6 shows.

Table 6: Experimental group and control group each activity time proportion contrast table

Activity content	A	B	C	D	E	F	Total Time
Experimental group	54.00%	16.50%	8.50%	8.00%	10.00%	3.00%	5400 s
Control group	50.00%	13.00%	9.50%	9.00%	10.00%	8.50%	
Difference	4.00%	2.50%	-1.00%	-1.00%	0.00%	-5.50%	
Significance	$P < 0.01$	$P < 0.05$	$P > 0.05$	$P > 0.05$	$P > 0.05$	$P < 0.01$	

Note: From A to F are respectively student training time density, teacher guiding time density, teacher observing and helping time density, teacher organizational measure time density, rest time density and unreasonable time density.

Through data in Table 6, it can get course training density contrast column diagram as Figure 1 shows.

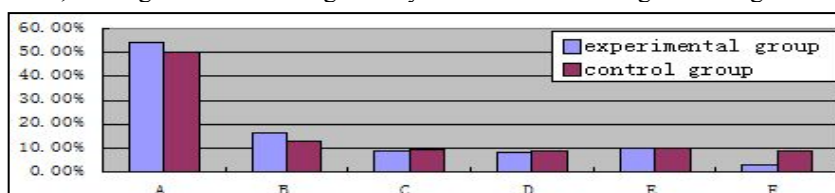


Figure 1: Experimental group and control group course training time density column diagram

Lots of indicators and factors decide tennis teaching quality. At first according to physical education basic features and physical education objectives, list out each factor that influences on physical education course quality, make respectively paired comparison of each indicator that selected by experts assessment, finally get each factor weight to tennis teaching course quality, formulate 6 first level indicators and 12 second level indicators in evaluation table and measure all Table's indicators with quantized value.

To make evaluation result more real, reliable and effective, evaluation table can be assessed by students, counterparts, experts and leaders. In evaluation process, to avoid human factors influence, 1 to 2 highest score and lowest score would be removed in final grade, adopt summation with weighted average method, evaluation table score G computational method is as formula (1) shows.

$$G = \sum w_i C_k \quad (1)$$

In formula(1), w_i represents evaluation set affiliating ranking, C_k represents overall evaluation on teacher teaching quality, whole testers average score X computational method is as formula(2) shows.

$$X = \frac{1}{n-2} \sum_{i=1}^{n-2} M_i \quad (2)$$

In formula(2), X represents teacher evaluation final score, M represents each rater score, n represents people numbers that participate grade.

Computational method of evaluation table total evaluation is as formula (3) shows.

$$X = \sum_{i=1}^6 a_i x_i \quad (3)$$

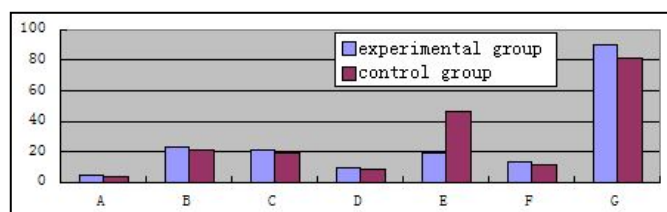
In formula(3), X represents teacher evaluation total score, a_i represents indicator weight coefficient, x_i represents single indicator score, computer-assisted teaching and traditional teaching course teaching quality contrast conditions is as Table 7 shows.

Table 7: Experimental group and control group teaching quality contrast table

Teaching item	A	B	C	D	E	F	G
Experimental group	4.7	23.6	21.3	9.2	19.1	13.2	90.1
Control group	4.2	21.7	18.9	9.0	46.3	11.3	81.4
Difference	0.5	1.9	2.4	0.2	2.8	1.9	8.7

Note: From A to G are teaching objective, teaching content, teaching method, teaching technique, teaching effect, total evaluation and final score

According to data in Table 7, it can get two group teaching quality contrast column diagram as Figure 2 shows.

**Figure 2: Tennis teaching course two group teaching quality score column diagram**

From Figure 2, it can be known that experimental group teaching quality with computer-assisted teaching has obviously an advantage over control group with traditional teaching.

Computer-assisted teaching performance analysis

After 3 months total 24 courses teaching, carry out theory course test, the result is students in experimental group get highest score as 96, lowest score as 63, average score as 80.9, their standard deviation is 8.857; while students in control group get highest score as 94, lowest score as 55, average score as 71.8, their standard deviation is 9.256; According to teaching management regulation, in teaching test, it should conform to normal distribution

theory, which means around 20% students arrive at excellent level, around 40% students arrive at good level, around 35% student arrive at qualified standard. Through experiment result handling, two group students average score is 76.38, standard deviation is 10.1. Due to student theory score conforms to normal distribution, then apply standardization formula as formula (4) shows.

$$\eta = \frac{\varepsilon - \mu}{\alpha} \quad (4)$$

Since 20% student are required to arrive at excellent level, the excellent performance is 86, 40% student are required to arrive at good level, the good performance is 73, 35% student are required to arrive at qualified level, the qualified performance is 61. Apply above methods to handle two group students theoretical knowledge test scores with SPSS statistics, it can get conditions as Table 8 shows.

Table 8: Experimental group and control group theoretical test score table

Groups	$X < 61$	$61 \leq X < 73$	$73 \leq X < 86$	$X \geq 86$	Total numbers of people
Experimental group	0	12	30	18	60
Control group	2	24	26	8	60
Difference	-2	12	4	10	0

From Table 8 data, it can get theoretical test two group students test scores column diagram number of people distribution conditions as Figure 3 shows.

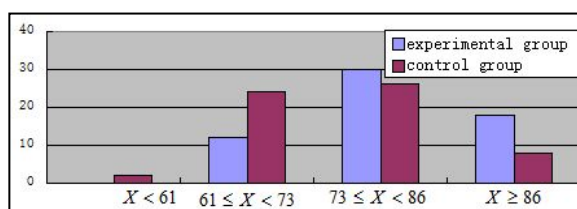


Figure 3: Experimental group and control group theoretical knowledge test result contrast column diagram

After teaching experiment, make statistics of all students usual performance, theoretical performance, technical performance and skill performance, according to academic comprehensive grade standard as formula (5) shows, it can get two groups students comprehensive performance contrast conditions as Table 9 shows.

$$\text{Total performance} = \text{usual performance} \times 10\% + \text{theoretical performance} \times 40\% + \text{technical performance} \times 25\% + \text{skill performance} \times 25\% \quad (5)$$

Table 9: Experimental group and control group students comprehensive performance contrast table

Groups	Usual performance	Theoretical performance	Technical performance	Total grade score	Significant difference
Experimental group	85	81	84	86.95	$P < 0.05$
Control group	82	74	78	80.35	
Difference	3	7	6	6.6	

CONCLUSION

This paper analyzed tennis teaching pattern features, stated modern physical education idea and tennis teaching objectives new era significance; Explored computer-assisted teaching features together with this teaching method and new era tennis teaching integrating point. Designed computer-assisted teaching experiment targeted on tennis teaching, the experiment was composed of 120 people that total divided into experimental group and control group such two groups, made track investigation of 3 months total 24 courses, applied SPSS statistics software to make data analysis of traditional teaching and computer-assisted teaching features before and after experiment as well as during experiment, got each factor features that computer-assisted teaching was over traditional teaching, and provided theoretical basis for tennis teaching reform.

REFERENCES

- [1] Tong Yan-Hua. *Journal of Shenyang sports college*, 2013. 32(3), 113-116.

[2] Wang Hao. *Journal of Jixi University*, **2013**.13(3), 150-151.

[3] Kong Xin-Liang. *Wuhan: Wuhan University*, **2007**.

[4] Jia Yong-Cheng. *Sports education*, **2013**. (69), 77-78.

[5] Bing Zhang, Sheng Zhang and Guang Lu. *Journal of Chemical and Pharmaceutical Research*, **2013**.5(9), 256-262.