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## **THE EFFECTS OF DIVERSE LEARNING METHODS ON TABLE TENNIS BACKHAND PUSH**

### **Abstract**

*The main purpose of this study is to explore the effects of diverse learning methods on table tennis backhand push. Eighty students (average height 165.3±8.37cm , weight 58.8±9.79kg , age 20.3±1.37 years) with no previous experience in table tennis from a local college were recruited and randomly assigned to four groups, namely control group, mental practice group, physical practice group, and mental-physical practice group. The experiment had lasted four weeks and three times per week; each session is 60 minutes. Results showed that 1. the mental-physical practice group has the best score on backhand push among the four groups, physical practice group ranked second and mental practice group ranked third. 2. The mental-physical practice and physical practice groups performed better than the other two groups in retention test. 3. Although less effective, the mental practice is beneficial to the beginners for learning table tennis backhand push.*

**Key words:** *mental practice, physical practice, table tennis backhand push*

### **I INTRODUCTION**

#### **1. Background and motive of this research**

Practice is a key factor in the sports skill learning. It is the most cost-saving and precise learning procedure and it facilitates the interaction between the faculty and students in sports skill learning process. Physical practice is one of the critical factors in increasing sports skill learning and performance (Chen, 1993). There are many sorts of practice methods. It is an important issue for the faculty to select appropriate practice methods to instruct students, improve students' sports skill learning and enhance performance.

The effect of the mental practice in sports skill learning is supportive by the scientific evidence. Because mental practice can perceive the acknowledgement of correct actions and ascertain correct actions, it truly can enhance students' learning ability during real competitions or simulation games of learning situations. The literature related to the mental practice is ample, such as the free throws in basketball (Buckles, 1984; Hall & Erffmeyer, 1983), serve the ball in tennis (Noel, 1980), jumping water (Badri, 1986; Grouios, 1992b). Moritz, Hall & Martin (1999) stated that delicate actions of the muscular application of (such as discus throwing) and the rough actions of the whole body muscle application are also related to the sports skill learning and performance. However, some researcher pointed out that there is no direct connection between mental practice and sports learning behaviours (Cho 1984 & Pai 1987). According to the aforementioned, there are positive and negative arguments with respect to the effect of mental practice toward sports learning behaviours. Generally speaking, researchers usually use "examination" to test the effect of sports skill learning, but it is not objective at some point. Therefore, in this study, the researchers will use "expert validity" to evaluate learners' outside actions to distinguish the learning effect. The researchers will focus on the effect of mental practice toward continuous attacking with forehand balls and testify by the outside actions.

Table tennis is a high skill difficulty sports which emphasizes the whole body coordinate and it was composed mainly of forehand attacking, backhand attacking and serving attacking. Generally speaking, it is easier for students to learn sports skill by his/her accustomed hand than the other hand. Backhand push has some certain difficulty and adaptability. It is the physical educators' responsibility to find a solution to improve learning effect. Therefore, the purpose of this study is to explore the effects of the table tennis backhand push toward the diverse learning methods and offer a recommendation for the future teaching curriculums.

## 2. Purpose of this study

According to the aforementioned, there are two main purposes in this study:

- (1). To explore the effects of the table tennis backhand push toward the diverse learning methods.
- (2). To explore the effect of the skill of the table tennis backhand push toward the diverse learning methods.

## II METHODOLOGY

1. Subjects are 80 students from the Tainan Woman's College of Arts and Technology (average height  $165.3 \pm 8.37$ cm, weight  $58.8 \pm 9.79$ kg, age  $20.3 \pm 1.37$  years) and they never experienced any training programs of table tennis skill before.
2. Time and location of this research: This survey was between April 5, 2006~April 30, 2006; the survey had lasted four weeks and three times per week; each session is 60 minutes. The location of this survey was in the table tennis arena of the Tainan University of Technology.
3. Survey Process:

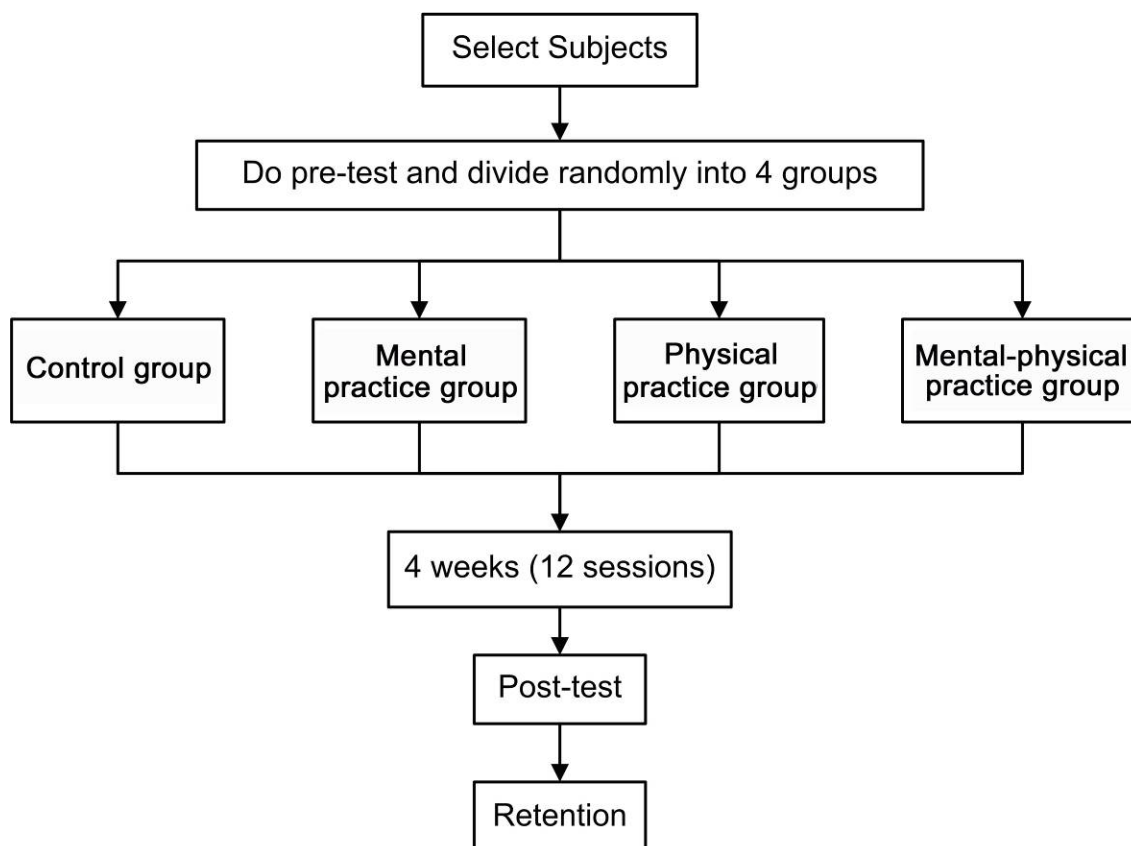


Chart 1 experiment flow chart

4. Research Tools and Instruments:

- (1). Ball: The brand is made from XUSHOOFA practice ball.
- (2). Table: The brand is made from butterfly (95080).
- (3). Serving Machine: The brand is made from XUSHOOFA (v988).
- (4). Recorder: The brand is made from SANYO (MCD-RX10RC).
- (5). Television: The brand is made from Panasonic (29TZF).
- (6). VCD player: The brand is made from PIONEER (890007).
- (7). Digital Recorder: The brand is made from SONY (TRV-33).
- (8). VCD: it was published by "Key Point" Corporation (3F., No.395, Sec. 1, Neihu Rd., Neihu District, Taipei City 114, Taiwan (R.O.C.))
- (9). Contents of the mental practice group and pre-recording cassette: This research adopts the edition of Martin (1995) and re-designs one module after referring to the study of Chen (2002) and Wang (2001). The contents include muscular relax training, image practice, perceptive behaviour correction and watching VCD of serving attacking.

5. Key skills to serve the Top Spin

Key skills:

- (1). Standing position: The learner stands besides the left side of the table and both feet stand the same width as the learner's shoulder. The right foot is slightly ahead of the left foot (approximately 3 inches). The learner's knees must bend slightly and the abdomen must draw back. Two elbows bend 90 degrees and is higher than the table surface. The upper body faces the straight forward and the racket is above the end line.
- (2). Ways of gripping racket: Competitive table tennis players grip their rackets in a variety of ways. The manner in which competitive players grip their rackets can be classified into two major styles. One is described as *shakehand*, and the other *penhold*. (a) Shakehand is so-named because one grips the racket similarly to the way one performs a handshake. The grip is referred to as a "Western grip" which is popular among players in Western countries. (b) Penhold is so-named because one grips the racket similarly to the way one holds a writing instrument. The thumb and index finger puts aside of the racket. This style is usually referred to as the Chinese penhold style, involves curling the middle, ring, and fourth finger back.
- (3). Keep Strategies in Stroke (a) transition of the center of the body: When the opponent hit the ball, the center of the body is rapidly located in left foot. However, when the ball bounces up, the center of the body moves from the left foot to the right foot. (b) Stroke sequences: when the center of the body moves to the left foot, the racket hand slightly draw backs. When the center of the body moves to the right foot, the racket push forward and the elbow must extend straightforward simultaneously. (c) The Hitting moment: the period between the ball bounce up and the highest point. (d) The transition of the center of the body and the stroke sequences are consistent and all of the actions must return to the original standby position after each stroke.

6. Process of the survey:

At the beginning, all of the 80 students trained the skill of backhand push. The subjects were divided randomly into four groups, namely control group, mental practice group, physical practice group, and mental-physical practice group. The experiment had lasted four weeks and three times per week; each session is 60 minutes. During the experimental stage, each group will experience different methods of experimental operation (see the Table 1). A post-test will follow as soon as the experiment is ended and a retention test will execute in 7 days after the experiment is ended.

Table 1 Experiment Control Table

<b>Group</b>	<b>control group</b>	<b>mental practice group</b>	<b>physical practice group</b>	<b>mental-physical practice group</b>
<b>Week</b>				
1 <sup>st</sup>	Subjects are only reading unrelated magazines or articles. They don't involve in any sports skill training programs.	Subjects are viewing the teaching VCD, backhand push, action practice, muscular relax training and mental practice	Teaching and practice of the backhand push.	Teaching and practice of the backhand push, muscular relax training and mental practice
2 <sup>nd</sup>				
3 <sup>rd</sup>				
4 <sup>th</sup>				

#### 7. Methods of test

The tests of this research include pre-test, post-test and retention test. The methods and contents of the experiment are identical and each student must accept 10-ball test. VCR will be utilized to record all of the actions during the test and the results will be assessed by the evaluators. There are 4 parts in sports skill evaluations: (1). standby action: standby actions before the forehand attacking, steps of standing position and allocation of the center of the body. (2). actions of racket drawing back: location of the racket, turning of the wrist, transition of the center of the body; (3). location of attacking ball and action of racket drawing back: to identify the location of attacking ball, to identify the transition of center of the body. (4). fluent action and coordination. Each section occupies 25 points and the total points is 100. In umpire selection, the standard is to pick up umpire with abundant teaching experience. Through the average score of 3 judges, we can get the actual points of the examinee. In order to achieve fair reliability among judges, three scores will be examined by Pearson product moment correlations.

Table 2 Relative Correlations among Judges

	<b>Judge A</b>	<b>B</b>	<b>C</b>
Judge A	--	.90*	.89*
B		--	.92*
C			--

\* $p < .01$

According to the results, the correlation is .90 .89 .92 respectively and it is positively related. Those figures demonstrate that umpire evaluates scores with a same standard.

#### 8. Limitation of this research

The subjects are the 80 students from the Tainan Woman's College of Arts and Technology and they never experience any training programs of table tennis skill before. The hypothesis is that all subjects can concentrate to learn table tennis and follow the directions which are regulated by the coach. All of the subjects are not allowed to do an additional practice. The subjects of this research are focused only on the college students, and it cannot be applied to other races, groups or other sports skills.

#### 9. Data analysis

This research uses analysis of covariance to analyze learning effects of each experimental group. If the result shows a significant difference, the main learning effects can compare with LSD. The obvious standard of this research is set up to  $\alpha = .05$ .

### III Results of this Research

According to the pre-test, post-test and retention test, we can get the following results.

Table 3 Mean and SD of Each Group

	Number	pre-test	post-test	retention
Control group M	20	22.3	22.7	22.7
SD		2.05	2.39	2.09
Mental practice group M	20	21.7	32.9	23.8
SD		2.56	3.83	2.71
physical practice group M	20	22.8	68.4	62.8
SD		1.88	3.88	3.94
mental-physical practice group M	20	22.3	73.4	70.9
SD		1.78	3.94	2.98

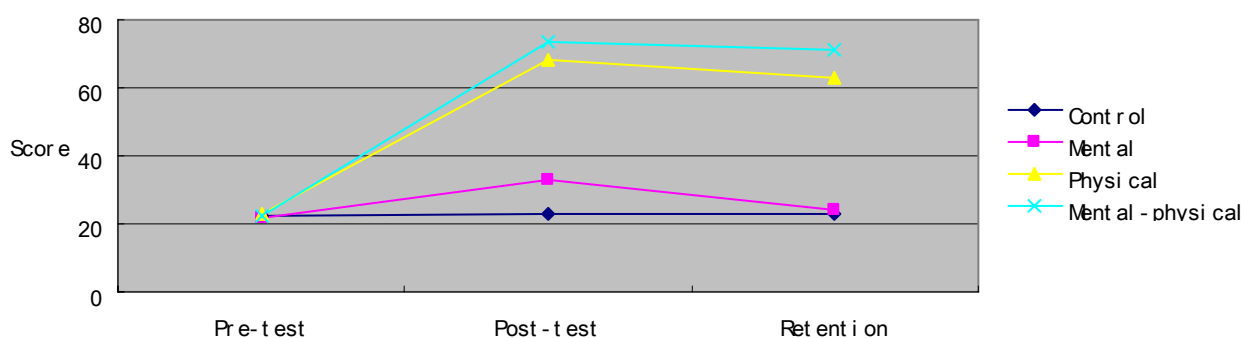


Chart 2 Line chart of each group' score

According to the above chart, we can get the following conclusion by utilizing two-factor mixed variance analysis.

Table 4 Two-factor Mixed Variance Analysis

Source of variance	SS	DF	MS	Value F	sig
Diverse tests	33851.20	2	16925.60	2275.09	.00*
Diverse groups	51661.75	3	17220.58	1501.68	.00*
Correlation	25537.21	6	4256.20	572.10	.00*

\*p<.05

According to the Table 4, there is a significant difference among the diverse tests (pre-test, post-test and retention test), diverse groups (control group, mental practice group, physical practice group and mental-physical practice group) and correlation. Therefore, we need to further examine it by means of pure validity.

Table 5 Pure Validity to Examine Variance Analysis

Source of variance	SS	DF	MS	F	sig
<b>Diverse groups</b>					
Pre-test	11.62	3	3.87	.88	.45
Post-test	38453.82	3	12817.94	1004.09	.00 *
Retention	38733.52	3	12911.17	1403.83	.00 *
<b>Diverse tests</b>					
Control group	1.73	2	.86	.17	.83
Mental practice group	1425.55	2	712.77	73.65	.00 *
Physical practice group	24715.37	2	12357.68	1085.01	.00 *
Mental-physical practice group	33245.75	2	16622.87	1806.49	.00 *

\*p&lt;.05

According to the Table 5, Value F of Pre-test is .88 ( $p>.05$ ), there is no significant difference among the four groups of pre-test and it confirms that all of the subjects in this experiment has the same qualification. The value of F in post-test and retention is 1004.09 and 1403.83 ( $p<.05$ ) respectively and it shows a significant difference. Therefore, we have to further examine them.

There is no significant difference in control group in diverse experiments ( $F=.17$ ,  $p>.05$ ); it shows a significant difference in mental practice group, physical practice group and mental-physical practice group. Therefore, those three groups have to further examine.

Table 6 Post-test Comparison of Each Group

	Control	Mental	Physical	Mental-physical
Control	-	10.26 *	45.69 *	50.76 *
Mental		-	35.43 *	40.49 *
Physical			-	05.06 *
Mental-physical				-
	Control	Mental	Physical	Mental-physical
Control	-	10.26 *	45.69 *	50.76 *
Mental		-	35.43 *	40.49 *
Physical			-	05.06 *
Mental-physical				-

\*p&lt;.05

According to the Table 6, there is a significant difference among the four groups in post-test experiment.

Table 7 Retention Comparison of Each Group

	Control	Mental	Physical	Mental-physical
Control	-	1.08	40.09 *	48.23 *
Mental		-	39.01 *	47.58 *
Physical			-	08.14 *
Mental-physical				-

\*p&lt;.05

According to the Table 7, there is a significant difference among the four groups.

Table 8 Comparison of Mental Practice Group

	Pre-test	Post-test	Retention
Pre-test	-	11.21 *	2.06 *
Post-test		-	9.15 *
Retention			-

\*p&lt;.05

There is a significant difference in mental practice group.

Table 9 Comparison of Physical Practice Group

	Pre-test	Post-test	Retention
Pre-test	-	45.57 *	39.99 *
Post-test		-	5.57 *
Retention			-

\*p&lt;.05

There is a significant difference in physical practice group.

Table 10 Comparison of Mental-physical Practice Group

	Pre-test	Post-test	Retention
Pre-test	-	51.13 *	48.64 *
Post-test		-	2.49 *
Retention			-

\*p&lt;.05

There is a significant difference in mental-physical practice group.

#### IV Conclusions and Recommendations

According to the aforementioned, we can discuss and divide the results into three parts, namely post-test, pre-test and retention.

##### 1. Post-test

According to the above results, mental practice is beneficial to the table tennis backhand push. This result is matched with the viewpoint of Weinberg & Gould (1999). Mental practice can clarify the acknowledgement of correct actions and accomplish correct actions. Mental practice can also enhance learning ability by the simulation of real games or learning situations. It is undoubted that physical practice is also beneficial to the table tennis backhand push; by means of repeated practices, it is really beneficial to learn correct actions and modify wrong actions. Mental-physical practice is more

beneficial and effective than single mental practice or physical practice. Mental-physical practice utilizes internal feeling rehearsal and learning actions and copes with external physical practical rehearsal; it is recognized as the best effective sports skill learning methods. This result is also identical with the study of Chen (2002) and Wang (2001). During the process of learning, not only physical practice but mental practice are emphasized; mental-physical practice can enhance student's learning effectiveness and facilitate student to further understand table tennis afterwards.

## 2. Retention

From the Table 5, we can find out one phenomenon, i.e. there is no significant difference between control group and mental practice group. Singer (1980) points out, factors that will influence retention effectiveness include: (1) the essence of sports skill actions; (2) the learning meaning of sports actions; (3) interval time; (4) medium activity of interval time; (5) situational condition of practice. According to the above results, because those subjects are the first time to touch table tennis and the interval lasts 7 days between post-test and retention test, the feeling toward table tennis sports skill will lessen. In physical practice group and mental-physical practice group, the former emphasizes external physical practice to recognize sports skill, the later incorporates internal and external feeling to enhance learning skills, so the retention effectiveness is better than the mental practice group.

## 3. Conclusions

From the results and discussions, we can conclude the following:

- (1). The mental-physical practice group has the best score on backhand push among the four groups.
- (2). Physical practice group ranked second and mental practice group ranked third.
- (3). The mental-physical practice and physical practice groups performed better than the other two groups in retention test.
- (4). Although less effective, the mental practice is beneficial to the beginners for learning table tennis backhand push.

## References

- Badri, D. (1986). *The effect of various regimens of visuo-motor behaviour rehearsal on the performance of competitive swimmers*. PH.D. Dissertion, Pacific Graduate School of Psychology.
- Buckles, T. M. (1984). *The effect of visuo-motor behaviour rehearsal on competitive performance tasks, anxiety and attentional style*. College of Human Development and Performance, University of Oregon, Ore, 1987, 2 Microfiches (152 fr): negative, ill.
- Chen, C. H. (1993). *The effect of visuo-motor behaviour rehearsal on learning badminton forehand low serve in beginner*. Unpublished master thesis, National College of Physical Education and Sports, Taiwan.
- Chen, Kuan-Chin (2002). *The effects of imagery practice on basketball free-throw skill learning*. Unpublished master thesis, National Taiwan Normal University, Taiwan.
- Cho, C. L. (1984). *The effect of mental practice on tennis forehand driving*. Unpublished master thesis, National Taiwan Normal University, Taiwan.
- Grouios, G. (1992b). The effect of mental practice on diving performance. *International Journal Sport Psychology*, 23, 60-69.
- Hall, E. & Erffmeyer, E. (1983). The effect viauo-motor behaviour rehearsal with videotaped modeling on free-throw accuracy of intercollegiate female basketball players. *Journal of Sport Psychology*, 5, 343-346.
- Lin, Ching-Ho (1996). *Sports learning theory*- Cheng-Wu-Chueh. Taipei: Wen-Shih-Che Publishing Company.
- Moritz, S. E., Hall, C. R., & Martin, K. (1999). Imagery use in sport: A literature review and applied model. *The Sport Psychologist*, 13, 245 - 268.
- Noel, R. (1980). The effect of visual-motor behaviour rehearsal on tennis performance. *Journal of Sport Psychology*, 2, 221-226.

- Pai, C. C. (1987). *The effect of mental practice on learning Korean traditional dancing basical skills*. Unpublished master thesis, National Taiwan Normal University, Taiwan.
- Wang, M. H. (2001). *The study of mental practice on Teenager Athletes' Tennis Serving and Driving*. Unpublished master thesis, Taipei Municipal University of Education, Taiwan.
- Weinberg, R., & Gould, D. (1999). *Foundations of sport and exercise psychology* (Second Edition). Champaign,IL: Human Kinetics.