

Relationship between Ball Control, Footwork and Table Tennis Performance of College Students

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Abstract: The aims of this study are to investigate (1) the relationship ball control and performance of table tennis, (2) the footwork and performance of table tennis, (3) the ball control and footwork with performance of table tennis. The participants were 25 female and 48 male college students at the fourth semester from PJKR Study Program students who took tennis courses. The research instruments were ball control tests, footwork tests, and match competition results. Pearson's correlation coefficient (r); zero order and partial, multiple correlation coefficients (R) and regression (F) were used to draw conclusions and to test the prerequisites for normality and linearity. The results show that (1) significant relationship ball control and performance table tennis for female at zero order correlation coefficient ($r = .380$ sig = .031) but not significant ($r = .376$ $t = 1.903$ sig = .070; $F = 3.873$ sig = .061) and not significant for male ($r = .125$ sig = .199; $r = .140$ $t = .947$ sig = .349; $F = .726$ sig = .398), (2) No significant relationship footwork and performance of table tennis for female ($r = .145$ sig = .244; $r = .134$ $t = .634$ sig = .532; $F = .497$ sig = .488) and male ($r = -.044$ sig = .344; $r = -.077$ $t = -.519$ sig = .606; $F = .088$ sig = .768), (3) and no significant relationship ball control and footwork with performance of table tennis for female ($R = .399$ $F = 2.088$ sig = .148) and male ($R = .146$ $F = .492$ sig = .615). The motor ability can't prediction the performance of table tennis for beginner level. Tactical approach more based than technical approach for basic beginner level. The decision making and skill execution should be main object in performance of sport.

1 INTRODUCTION

Table tennis is a sport that is already popular in the society, which is much favored by the public as leisure time sport, sports to get achievements and for educational sports. The table tennis game is a racquet sport that is popular in the world and the number of participant ranks second (Larry Hodges, 1996). The possibility of playing table tennis is popular because this game requires relatively inexpensive facilities and infrastructure, as the time and place are relatively short and narrow. The playing field is only a table surface with an area of approximately 5 m² and requires a terrain or an area of approximately 50 square meters. Hence, it does not require a large space and the table can be placed indoors or outdoors such as in classrooms, halls, offices, or in the office yard, school or home. Besides, the equipment is relatively inexpensive and easily available. It merely needs a racket and ball which have affordable prices. This game can also be played anytime, anywhere, and by anyone, in the

sense that it can be played in the morning until night, inside or outside the room, by children or adults, men or women, with varied objectives (recreation, achievement, or education).

Table tennis game is guided by technical, physical and psychological principles. The technical principle means that in table tennis, it is necessary to master various types of techniques such as gripping techniques, ball control, punches, and legs that are displayed in games. The physical principle means that table tennis requires good physical conditions such as speed, strength, agility, endurance, flexibility, balance, accuracy, and fitness to always be ready to maintain the game. The psychological principle in table tennis game is intended requires psychological elements such as intelligence, emotion, motivation, perception, pleasure, excitement, enthusiasm, and sportsmanship in playing table tennis.

Good players are the one who able to understand game techniques and able to apply them in matches according to the applicable regulations. The

technique includes: 1) grip, 2) stance, 3) stroke and 4) foot work. The mastery of these techniques requires regular, measurable and continuous training in the guidance of the right trainer or sports teacher. Having the right mastery of technique, someone will be a reliable table tennis player (Damiri and Kusnaedi, 1992).

The table tennis game also requires excellent physical support, because playing the game requires a fast, precise and high intensity motion. This is due to the demands of the equipment and facilities used. They are a table with a relatively narrow surface area of $\pm 5 \text{ m}^2$ with a high reflective power to the ball, a racket/ bat made of rubber coated wood that has a fast reflecting power to the ball, a relatively low net, and a ball made of material that has strong reflective strength inside relatively small spherical shape. Thus, it requires excellent physicality so that the players can adjust to the nature of the tools and facilities. In this case, the physical factors are the nervous system, agility, speed, strength, endurance, explosive power, accuracy, flexibility, precision and awareness of motion. The most actual theoretical performance analysis techniques in table tennis are: performance indices, simulative approaches, momentum analysis, footwork analysis, and finally an approach which uses top expert knowledge for a comprehensive technical-tactical analysis. (Michael Fuchs, Ruizhi Liu, Ivan Malagoli Lanzoni, Goran Munivrana, Gunter Straub, Sho Tamaki, 2018).

When beginner level table tennis players want to master the technique well, they need to master the technique of touching, bounce, and balancing first of the ball. These exercises need to be studied in advance so that the player is able to control the ball correctly. Besides that, a good physical condition is needed. The coaches need to do a survey on anthropometric measures, physical performance, and motor coordination skills, so that it can be used to talent scouting (Robertson, K., Pion, J., Mostaert, M., Wazir, MRWN., Kramer, T., and Faber, IR., 2018). Developing the ball control in table tennis is probably the most essential skill. It refers to the ability to return the ball during the game.

In a table tennis game, technical and physical abilities are very necessary to win the game. Having good technique and good physical ability, they will be able to deal with the challenges in table tennis easily. In this case, the ability to control the ball and to hit with various techniques is expected to be able to contribute the performance of table tennis.

The table tennis sport for PJKR students is the elective courses taken in the even semester. In the current semester, many PJKR students take this

course. From the lecture attendance data, it is known that 48 students took this course. The table tennis courses provide the students the theory and practice so that they can master the table tennis game. In theory, the students are expected to be able to understand the nature of table tennis, history, tools and facilities, techniques, tactics, game and match rules, the holding of table tennis matches and the refereeing. While through practices, it is expected that the students are able to play both single and double table tennis with basic techniques and tactics, as well as being able to host matches and to be a referee correctly.

In fact, most students who take this course did not know and were not skilled in table tennis so that they can be categorized as beginner level. Thus, the learning started from the basics, like the technique of grip, punches, and foot exercises. Ball control techniques were carried out at the beginning of the lecture in a table tennis game so that the students were able to master the bat and the nature of the ball. By mastering the ability to control the ball, students will be able to master the next level of technique easily, especially in hitting the ball. In table tennis, this hitting technique is important because by acquiring the technique a table tennis player will get chance to win a match. The problems that arise in this lecture were the ability to control the ball and hit various balls. In this case, the ability to control the ball well and the ability to hit the ball properly will have a positive impact on playing table tennis. Since the significant relation between the ability to control ball and the ability to hit the ball in a table tennis game in physical education college students was not known empirically, the researchers were interested in conducting research on the relation between ball control and footwork with performance of table tennis for physical education college students.

2 METHODS

2.1 Participants

There were 25 female and 48 male college students from physical education program, faculty of sport science Universitas Negeri Yogyakarta as the participants. They took table tennis class and volunteered in this study. The participants were from a range of outfield playing positions and were involved in regular trainings and matches.

2.2 Ball Control Test

The ball control test was modified from Short Wall-Volley Test for racquetball skill (Lacy and Hastad, 2007) with bet and table tennis ball. The participant stood behind the line (1.37 meters from wall), dropped the ball, and stoke it against the front wall (up than .76 meters from floor) and floor for 30 seconds. The students stood while holding the table tennis ball in one hand and bet in the other hand behind the line. To begin, the student dropped a ball and volleyed it against the front wall as many times as possible in 30 seconds. All legal hits must be hit in the air after rebounding from the front wall and after bouncing the floor. Many bouncing the floor were illegal hits. Any stroke (forehand and backhand) might be used to keep the ball pay. The student might step into the front line to retrieve the ball that fail to return the past the line but they must return behind the line for the next stroke. The score was derived by counting the number of times to the ball legally strikes the wall within 30 seconds. The tester might be located either inside the court or in an adjacent viewing area. The 30-second count should be commenced when the student dropped the ball.

2.3 Footwork Test

The footwork test used was the Edgren 10 second side step test. That test will help assess the ability to move with precision and speed (Reiman and Manske, 2009). The equipment of test was a flat, non-slip floor, with line markings or cones (masking tape can be used), a tape measure, and a stopwatch. The pre-test was conducted in some steps. First, the researchers explained the test procedures to the subject. Second, the researchers performed screening of health risks and obtained the informed consent. Third, the researchers prepared forms and recorded basic information such as age, height, body weight, gender, test conditions. Fourth, the researchers measured and mark out the test area. The last, the researchers performed an appropriate warm-up. See more details of pre-test procedures. As the test setup, five cones or lines were placed in a line, three feet apart (12 feet total between the two outside cones). The following is the test procedure: (1) the starting position was at the center cone, facing forward with feet straddling the center line; (2) at the command 'go', the participant sidestepped to the right until their right foot touched or crossed the outside cone or tape mark; (3) the participant then sidestepped to the left until their left foot touched or crossed the left

outside cone or tape mark. The participant sidestepped back and forth to the outside cones as rapidly as possible for 10 seconds. The scoring test procedure is as follows : (1) counted the number of cones/lines crossed; (2) would deducted a point if the far end lines were not reached, if they failed to keep their trunk and feet pointed forward at all times, or crossed the legs. The best results of three trails must be recorded.

2.4 Table Tennis Performance

The performance table tennis was measured using real games, in which each participant played nine games for male college students and five games for female college students. The game that they played was only one set with score of 11. The game stopped after one participant got score of 11. The performance score of table tennis was overall obtained by all games that they played.

2.5 Statistic Analysis

The results were presented as mean (M) and standard deviation (SD). The Kolmogorov-Smirnov (K-S) test was used to check the distribution of variables. Pearson's correlation coefficient (r) both zero order and partial, and multiple correlation coefficient (R) were used to determine the relationship between ball control, footwork and performance of table tennis. Magnitude effect for the correlations was based on the following scale by Hopkins; trivial: < .10; small: .10- .29; moderate: .30- .49; large: .50- .69; very large: .70- .89; nearly perfect: > .90 (Nimphius, McGuigan, and Newton, 2010). Regression (F) was used to determine the contribution ball control, footwork and performance of table tennis. A level of sig \leq .05 was used as the criterion for statistical significance.

3 RESULTS AND DISCUSSIONS

3.1 Results

Table I shows that male college students are better than female on ball control (M= 22.85 and 19.44) and footwork (38.00 and 34.04). All variables for the male and female college students are in normal distribution ((K-S= .83- .168 and sig= .072- .200).

Table 1: Mean (\pm SD) and normality data.

Variable	M (\pm SD)	Range	K-S (sig)
Female (n = 25)			
Ball Control	19.44 (\pm 4.053)	12 – 29	.168 (.072)
Footwork	34.04 (\pm 4.420)	26 – 42	.129 (.200)
Performance	39.52 (\pm 10.786)	19 – 55	.107 (.200)
Male (n = 48)			
Ball Control	22.85 (\pm 3.364)	15 – 30	.101 (.200)
Footwork	38.00 (\pm 4.552)	29 – 48	.121 (.074)
Performance	80.19 (\pm 12.189)	45 – 99	.083 (.200)

Table 2 shows significant zero order coefficient correlation between ball control and performance table tennis for female ($r = .380$; $sig = .031$) and not significant for male ($r = .125$; $sig = .199$). There is not any significant partial coefficient correlation between footwork and performance of table tennis for female ($r = .376$; $t = 1.903$; $sig = .70$) and for male ($r = .140$; $t = .947$; $sig = .349$). There is not any significant zero order coefficient correlation between footwork and performance of table tennis for female ($r = .145$; $sig = .244$) and for male ($r = -.044$, $sig = .334$). There is not any significant partial coefficient correlation between footwork and performance of table tennis for female ($r = .134$; $t = .634$; $sig = .244$) and for male ($r = -.077$; $t = -.519$; $sig = .606$).

The relationship between ball control and performance of table tennis was moderate for female and small for male. The relationship between footwork and performance of table tennis was moderate for female and small for male. The relationship between ball control, footwork and performance of table tennis was small for female and trivial for male.

Table 2: Correlation and regression.

Variable	R		R	F (sig.)
	Zero Order (sig.)	Partial t (sig.)		
Female				
Ball Control	.380 (.031)*	.376 1.903 (0.70)		3.873 (.061)
Footwork	.145 (.244)	.134 .634 (.532)		.497 (.488)
Ball Control & Footwork			.399	2.088 (.148)
Male				
Ball Control	.125 (.199)	.140 .947 (.349)		.726 (.398)
Footwork	-.044 (.334)	-.077 -.519 (.606)		.088 (.768)
Ball Control & Footwork			.146	.492 (.615)

*Significant

There is not any significant multiple coefficient correlation and regression ball control and footwork for performance of table tennis for female ($R = .399$; $F = 2.088$; $sig = .148$) and male ($R = .146$; $F = .492$; $sig = .615$). There is not any significant regression ball control for performance of table tennis for female ($F = 3.873$; $sig = .061$) and male ($F = .726$; $sig = .398$). There is not any significant regression footwork for performance of table tennis for female ($F = .497$; $sig = .488$) and male ($F = .088$; $sig = .768$).

Table 3 shows coefficient correlation and contribution. The contribution of ball control to playing table tennis is simple at 1.56% and 14.44%, with footwork control at 1.96% and 14.14% in college and university students. This shows that the contribution of ball control by controlling footwork increased in male students and decreased in female students. While the contribution of footwork in table tennis game was simple at .19% and 2.10%, with ball control as much as .59% and 1.80% for college and university students. This shows that the contribution of footwork by controlling ball control increased in students and decreased in college students.

From the contribution obtained by the addition of the ability to play table tennis, the addition of the contribution of ball control variables for male students was .57% and for female students was 1.48%. While the addition of the contribution of footwork variables for male students were 1.94% and for female students was 13.82%. An additional contribution was made to the ball control and footwork variables. The footwork variable is greater when added to the ball control variable than vice versa, both in the student and student groups. This illustrates that the ball control variable has more influence on footwork.

Table 3: Correlation and contribution.

Relationship with Table tennis performance	Correlation	Contribution
Male		
Ball Control	.125	1.56 %
Ball Control – (Footwork)	.140	.96 %
Footwork	-.044	.19 %
Footwork – (Ball Control)	-.077	.59 %
Ball Control & Footwork	.146	2.13 %
Female		
Ball Control	.380	14.44 %
Ball Control – (Footwork)	.376	14.14 %
Footwork	.145	2.10 %
Footwork – (Ball Control)	.134	1.80 %
Ball Control & Footwork	.399	15.92 %

Table 4 shows the relative and effective contribution. The contribution (relative and effective) ball control variable (83.88% and 1.80%) is greater than the footwork variable (16.12% and 0.34%) in the student group. Likewise, the contribution of students (relative and effective) to the ball control variable (88.67% and 14.14%) was greater than the footwork variable (11.33% and 1.81%).

Table 4: Relative and effective contribution.

Predictor Variable	r	Relative	Effective
Male			
Ball Control	0,125	83,88 %	1,80 %
Footwork	-0,044	16,12 %	0,34 %
Total		100,00 %	2,14 %
Female			
Ball Control	0,380	88,67 %	14,14 %
Footwork	0,145	11,33 %	1,81 %
Total		100,00 %	15,95 %

3.2 Discussions

The ability of ball control and footwork for male were better than female. In general, almost all physical elements and biomotor male were better than female. In athletic sports, as mothers of all sports, the track record of male athletes was always faster, stronger, far and high than female athletes. In the field of tennis, male athletes had to play three sets for a victory, while female athletes only played two sets. In the volleyball game, male athletes must use a net as high as 144 centimeters, while female athletes only used 142-centimeter net. Table tennis game will not have male athletes against the females, except in mixed doubles. This illustrates that male athletes were indeed considered to have an advantage compared to female athletes.

The ability of ball control and footwork did not show a significant relationship and was unable to contribute significantly to the performance of table tennis. There was not any relationship between the factors of body combination and basic futsal skills (Kooshaki, Nikbakht, and Habibi, 2014). The components of motor skills were not able to provide accurate predictions for beginner level table tennis players. The motor ability factor is only a foundation for mastering certain sports skills, including table tennis. After that, technical skills must be mastered first before the tactical skills. Good motor skills only provide opportunities for mastering broader or better technical and tactical skills, but are not automatically able to master them as it depended on their talents and potential. Even with the mastery of

better technical and tactical skills, they are able to excel in playing table tennis even though they only have poor motor skills.

Age can be a determining factor in technique capacity, both general and specific (Garcia, Navarro, Grande, Ignatova, and Sampedro, 2010). Among athletes, age is not the actual age, but over the age used to practice mastering the sport. Considering that they have the same talent and potential, then someone who starts training at a smaller age, with the same practice, will acquire higher the level of skill. The students of physical education study program, as the participants did not have a relatively similar age, but they know table tennis in a variety of ways. Some of them know the game since they were a child and there are also students were new to the game. Thus, the participants who had a diversity of knowing table tennis did not describe that the results of the skills of playing table tennis as a result of the course. Therefore, the selection of physical education study program students as beginners was not accurate, it would be better if the selection of participants in a table tennis association had restrictions at a young age.

In table tennis, players may hit be ball randomly towards either side of the table, creating a great degree of uncertainty in the opponent who does not know this information in advance, so swift movement and quick decisions which are taken in split seconds are essential in table tennis success (Toriola, Toriola, and Igbokwe, 2004). There is a variable between physical and motoric abilities with the sport performance. It is the mastery of how to play. Thus, the tactic approach is very much continued to be given in learning. The tactical approach is more important than the technical approach at the basic level. After they are able to master the specific techniques tactically, the students at the beginner level are able to master the skills to play table tennis more fully.

4 CONCLUSIONS

The ball control and footwork of the male college students were better than the female ones. In this case, there was not any significant relationship between those elements and there was not any estimation regarding the performance of table tennis game. The physical education students were not at the level of table tennis athletes. There were many intervening variables between the physical and motoric abilities with the performance of table tennis, thus the tactic approach needs to be equipped

in the learning. The tactic approach takes precedence over learning sports games in general and net games specifically for students with diverse backgrounds. Assessment of playing tactic mastery is also more considered in addition to the assessment of mastery of the technique. The next conclusion is that the tactical approach is more important than the technical approach at the basic level. After they are able to master the specific techniques tactically, the students at the beginner level are able to master the skills to play table tennis more fully.

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