

The Effect of Imagery Training and Concentration on Forehand Serve Accuracy of the Junior Table Tennis Athletes

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Abstract

This research aims to uncover: 1) the difference in the effect of internal imagery and external imagery on the forehand serve accuracy of the PTM Dwi Bengawan Solo players, 2) the difference in the effect of high concentration and low concentration on the forehand serve accuracy of Junior Table Tennis Athletes in Sukoahrjo, and 3) the interaction between training methods and concentration on the forehand serve accuracy of the Junior Table Tennis Athletes in Sukoharjo. This is an experimental research. The research samples were determined by using total sampling technique, while the total samples and population were 24 junior athletes in PTM Dwi Bengawan Solo. The data were collected using: 1) concentration test of PTM Dwi Bengawan Solo players and 2) forehand serve pretest. The research instrument included 2 tests, namely the forehand serve accuracy test with validity (0.809) and reliability (0.988). The concentration test with validity (0.89) and reliability (0.803). The data were analyzed using the two-way ANOVA with a significance level of $\alpha = 0.05$. The results showed that: 1) There was a significant difference between internal imagery and external imagery training ($p = 0.000 < 0.05$), so the internal imagery training method was better than external imagery. 2) There was a difference between players who had high concentration and low concentration ($p = 0.000 < 0.05$), so players who had high concentration were better than those who had low concentration. 3) There was an interaction between internal imagery and external imagery as well as high and low concentrations ($p = 0.047 < 0.05$). Players who had high concentration would perform better if trained with internal imagery, while players who had low concentration would be better if trained with external imagery.

Keywords

mental imagery;
concentration;
forehand serve
accuracy



I. Introduction

Until now, table tennis game grows rapidly and it gets even more popular around the world. According to Mangolo (2020) tennis is a game that uses arms to swing singly (one on one) and doubles (two against two) and tennis is a complex sport, which uses almost all physical components. The table tennis game will run well if the supporting factors of the game are well mastered. Those factors consist of physical, technical, tactical, and mental factors. Thus, the four factors have to be trained regularly, continuously, and in a well-planned manner to improve the athletes' achievements. Athlete's aspect is the most important of all the four factors. The athlete's aspects consist of talent, motor skills, physical abilities, mental qualities, and emotional aspects. It is why that the table tennis is one kind of sport that requires the players to have good mental abilities. Mental is a very important aspect needed in almost all sports. Therefore, in order to improve achievements,

athletes not only need to have physical abilities, techniques, and tactics, but also mental training to improve their mental performance. According to Rushall (Komaruddin, 2013:2), mental skills training for sport is designed to improve the athletes' psychological performance and skills. If this aspect is fulfilled, it is ensured that the athletes will get great achievements, it is as Ibrahim (2008:112) said, "to achieve peak performance as a manifestation of self-actualization for athletes, the main asset is to have excellent health, both physically and mentally, so that maximum achievement is ensured".

Considering that the „serve“ is the very first attack and the most important factor in table tennis. There are two types of serve in table tennis game: forehand and backhand serves. Forehand serve has become an option because the ball served becomes unpredictable and the direction is floating (MacKanzie, Kortegaard, LeVangie, et al, 2012: 579). Based on the above data, it can be observed that the ball direction in forehand serve is difficult to predict and it will be hard for the opponent to „read“ the ball. Serve is important because it is the first attack. The ultimate goal of serve is no other than to earn points.

There are a few things that have to be trained in order to execute a good ball serve, one of which is through psychological training or the so-called imagery training. However, in fact, there have not been many teams who applied psychological (mental) training within the training programs provided, the trainers only focused on physical training, techniques and tactics. In addition, high concentration is also needed to perform good serve techniques to place the ball towards the opponent's corner of the table.

Imagery is a quite popular mental exercise in sports. Imagery training is a technique often used by coaches and sports psychologists to improve the athlete's performance (Hojjati, 2014: 712). Concentration is one of the things that can be improved by imagery training. Hojjati (2014: 712) mentioned that imagery is a cognitive process in the brain that is important in the process of body motion. Mental imagery is a series of activities to imagine or bring back in the mind an object, event or experience of motion that is correct and has been stored in memory (Hidayat, 2010: 193). The mental imagery training model is based on how the athletes are able to imagine him and others when performing a technique.

Mental training comes in many different types of training methods. Wiernberg & Gould (2007: 296) stated that the mental training covers imagery, visualization, mental rehearsal, symbolic rehearsal, covert practice and mental practice. In the implementation of mental imagery training, there is a division of perspectives. The imagery perspective is able to harm the athletes themselves and others when used in performing techniques. There are two types of imagery: internal and external (Wiernberg & Gould, 2007: 301). Assistance is required in implementing these two types of training.

Based on the discussion with the coach of PTM HTC Sukoharjo and field observation, the junior athletes used the forehand serve technique. However, there was a fact that many junior athletes were lacking of serve accuracy and they often failed in executing the serve. Thus, a research on the forehand serve ability was carried out by providing mental training that consists of internal and external imageries training. It is expected that this form of training would help the athletes to concentrate when they perform the forehand serve and produced a high level of accuracy.

II. Research Methods

2.1 Design of Research

This was an experimental research which used the 2x2 factorial design, so this research aimed to validate the effect of one or more variables to the other variables. The experimental research can be interpreted as a research method used to find the effect of certain treatments on others under controlled conditions, the experimental research method is quantitative research (Sugiyono, 2015: 109). Purwanto (2016: 120) said that experiment is a strong research method since it is the most prominent research design to test the cause-effect hypothesis, if compared to the correlational or casual comparative designs. Meanwhile, the research design used the initial and final group test (2x2 factorial design).

2.2 Participants

The research subject used the total sampling technique or a total sample of the total population which consisted of junior athletes in PTM Dwi Bengawan Solo. The research samples were determined based on the athletes' concentration levels. There were 24 junior athletes of PTM Dwi Bengawan Solo. The athletes were then given the concentration test to classify them into high concentration category and low concentration category. The classification consisted of 12 top-ranked athletes who had high concentration and 12 bottom-ranked athletes who had low concentration. The two data classifications were then divided randomly into two groups, so there were 6 athletes with high concentration which would be trained using the internal and external imageries. On the other hand, there were also 6 athletes who had low concentration which would be trained using the internal and external imageries. After that, the athletes who had high and low concentration levels from each group were given the pretest by using the forehand serve test. It was done before carrying out the treatment application in the experiment.

2.3 Instrument and Data Analysis Technique

The data collection instrument in this study used a concentration test (Grid Concentration Test). Athletes were observed based on the instructions specified in the concentration test to scan columns containing numbers and sort them from the smallest into the largest number within 1 minute. The step was then followed by observing the forehand serve accuracy. The athletes were instructed by serve 10 times by placing the ball in the value column written on the tennis table. Then, the pretest, treatment, and posttest were carried out.

The data were analyzed using the SPSS 20, which was using the two-way ANAVA at a significance rate of $D= 0.05$. Furthermore, Tukey test is used to compare the average pairs of treatments used (Sudjana, 2002: 36). Considering that the research data were analyzed using ANAVA, a prerequisite test needed to be carried out before stepping into the two-way ANAVA utilization. The prerequisite test consisted of: (1) normality test and (2) variant homogeneity test and hypothesis test.

III. Results and Discussion

3.1 Results

a. Data Description

This research provided results and their interpretations. The research results

presented were related to data description, pretest, and posttest. The results of the research data collection were then recapitulated and analyzed using descriptive statistical analysis, then the data were tested for normality and homogeneity before the ANAVA test. The following table shows the statistics description of the pretest and posttest results of the forehand serve test for Junior Table Tennis athletes:

Table 1. Descriptive Statistics of the Pretest and Posttest of the Forehand Serve Accuracy

Method	Concentration	Statistics	Pretest	Posttest
Internal Imagery	High (A1B1)	Amount	114.00	157.00
		Average	19.00	26.17
		SD	1.549	1.602
	Low (A1B2)	Amount	100.00	126.00
		Average	16.67	21.00
		SD	1.033	0.894
External Imagery	High (A2B1)	Amount	105.00	142.00
		Average	17.50	23.67
		SD	1.643	1.751
	Low (A2B2)	Amount	98.00	127.00
		Average	16.33	21.17
		SD	0.816	0.983

Table 2. Normality Test

Data	<i>p</i>	Significance	Information
<i>Pretest</i> A1B1	0.200	> 0.05	Normal
<i>Posttest</i> A1B1	0.200		Normal
<i>Pretest</i> A2B1	0.200		Normal
<i>Posttest</i> A2B1	0.200		Normal
<i>Pretest</i> A1B2	0.117		Normal
<i>Posttest</i> A1B2	0.200		Normal
<i>Pretest</i> A2B2	0.117		Normal
<i>Posttest</i> A2B2	0.094		Normal

Based on the statistical analysis of the normality test that has been carried out using the Kolmogrov-Smirnov test, all the pretest and posttest data on forehand serve accuracy resulted in the significance value of data normality test of $p > 0.05$, which means that the data were normally distributed.

Table 3. Homogeneity Test

Group	Leavene statistic	Sig.	Information
Pretest	1.322	0.295	Homogen
Posttest	1.134	0.359	Homogen

The above table is based on the statistical analysis of the homogeneity test that has been carried out using the leavene statistic test. At the pretest, the significance value was $0.295 \geq 0.05$. It means that the data group has a homogeneous variant. Likewise, the results of the calculation on the posttest showed a significance value of $0.359 \geq 0.05$. It means that the data group has a homogeneous variant. Thus the population has the same variant or homogeneity.

**Table 4. Anava Test
Tests of Between-Subjects Effects**

Dependent Variable: Forehand Serve Accuracy Result

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	107.000 ^a	3	35.667	19.279	.000
Intercept	12696.000	1	12696.000	6862.703	.000
Training Model	8.167	1	8.167	4.414	.049
Concentration	88.167	1	88.167	47.658	.000
Training Model * Concentration	10.667	1	10.667	5.766	.026
Error	37.000	20	1.850		
Total	12840.000	24			
Corrected Total	144.000	23			

a. R Squared = .743 (Adjusted R Squared = .705)

The hypothesis testing was done based on the data analysis results and the two-way ANOVA analysis interpretation. The ANOVA test results showed that there was a significant difference between the internal imagery training method and the external imagery training method on the forehand serve accuracy of the table tennis junior athletes. In addition, there was a significant difference in the effect of table tennis junior athletes who had high concentration and low concentration on the accuracy of forehand serve. There was also a significant interaction between the imagery training method (internal imagery and external imagery training method) and concentration (high and low) on the accuracy of forehand serve of the junior table tennis athletes. The following is a graphic image of the interaction between imagery training methods and concentration types:

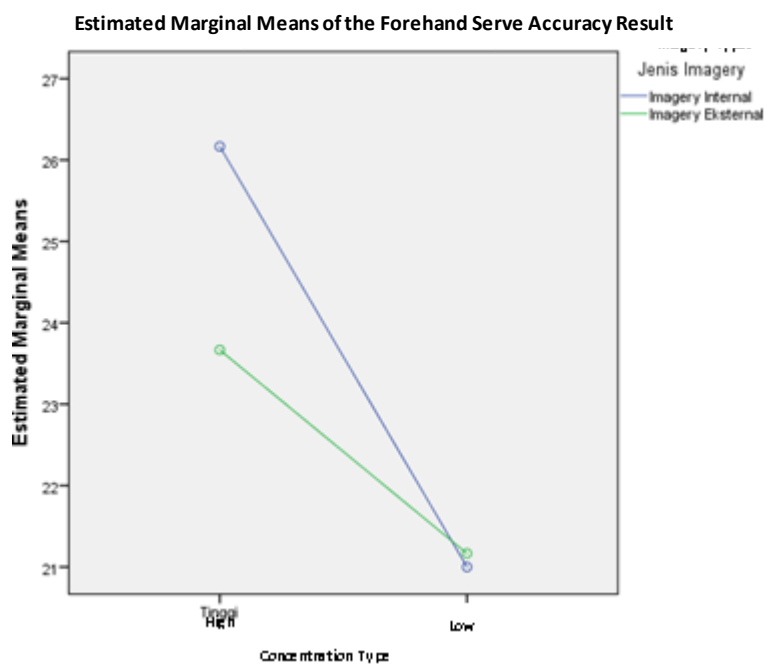


Figure 1. *The Results of the Interaction between Imagery Training Methods and Concentration*

After being tested and it was found that there was an interaction between imagery training methods (internal and external imagery training) and the concentration (high and low) to the forehand serve accuracy of the Sukoharjo junior table tennis athletes, a follow-up test needed to be carried out using the Tukey test. The follow-up test results are presented in the following table:

Table 5. Post Hoc Test

Group	Interaction	Std, Error	Sig,
A1B1	A1B2	.770	.000
	A2B1	.770	.044
	A2B2	.770	.000
A2B1	A1B1	.770	.044
	A1B2	.770	.026
	A2B2	.770	.044
A1B2	A1B1	.770	.000
	A2B1	.770	.026
	A2B2	.770	1.000
A2B2	A1B1	.770	.000
	A2B1	.770	.044
	A1B2	.770	1.000

Note:

A1B1: The group of athletes who had high concentration level and were trained using the internal imagery training method

A1B2: The group of athletes who had low concentration level and were trained using the internal imagery training method

A2B1: The group of athletes who had high concentration level and were trained using the external imagery training method

A2B2: The group of athletes who had low concentration level and were trained using the external imagery training method

Based on Table 5, the Tukey test results showed that the pairs who had significant interactions or partners were: (1) A1B1-A1B2, (2) A1B1-A2B1, (3) A1B1- A2B2, (4) A2B1-A1B1, (5) A2B1-A1B2, (6) A2B1-A2B2, (7) A1B2-A1B1, (8) A1B2-A2B1, (9) A2B2-A1B1, dan (10) A2B2-A2B1. Thus, it can be concluded that:

- 1) If the group of athletes who had high concentration level and got the internal imagery training were paired with the group of athletes who had low concentration and got the internal imagery training, there would be a significant difference of effect, with a significance value of $0.000 < 0.05$.
- 2) If the group of athletes who had high concentration level and got the internal imagery training were paired with the group of athletes who had high concentration level and got the internal imagery training, there would be a significant difference of effect, with a significance value of $0.044 < 0.05$.
- 3) If the group of athletes who had high concentration level and got the internal imagery training were paired with the group of athletes who had low concentration level and got the external imagery training, there would be a significant difference of effect, with a significance value of $0.000 < 0.05$.
- 4) If the group of athletes who had high concentration level and got the external imagery training were paired with the group of athletes who had high concentration level and got the internal imagery training, there would be a significant difference of effect, with a significance value of $0.044 < 0.05$.
- 5) If the group of athletes who had high concentration level and got the external imagery training were paired with the group of athletes who had low concentration level and got the internal imagery training, there would be a significant difference of effect, with a significance value of $0.026 < 0.05$.
- 6) If the group of athletes who had high concentration level and got the external imagery training were paired with the group of athletes who had low concentration level and got the external imagery training, there would be a significant difference of effect, with a significance value of $0.044 < 0.05$.
- 7) If the group of athletes who had low concentration level and got the internal imagery training were paired with the group of athletes who had high concentration level and got the internal imagery training, there would be a significant difference of effect, with a significance value of $0.000 < 0.05$.
- 8) If the group of athletes who had low concentration level and got the internal imagery training were paired with the group of athletes who had high concentration level and got the external imagery training, there would be a significant difference of effect, with a significance value of $0.026 < 0.05$.
- 9) If the group of athletes who had low concentration level and got the external imagery training were paired with the group of athletes who had high concentration level and got the internal imagery training, there would be a significant difference of effect, with a significance value of $0.000 < 0.05$.

- 10) If the group of athletes who had low concentration level and got the external imagery training were paired with the group of athletes who had high concentration level and got the external imagery training, there would be a significant difference of effect, with a significance value of $0.044 < 0,05$.

3.2 Discussion

a. The Effect of Internal Imagery and External Imagery Training Methods on the Accuracy of the Forehand Serve

The first hypothesis testing showed that the internal and external imagery training methods had significant difference of effect in improving the forehand serve accuracy. Firmansyah (2011) stated that there is a significant difference in giving the imagery method to gymnastic skills. This is in line with the theory (Olsson 2008: 133) which said that imagery training can improve the performance of athletes or players.

In this research, the internal imagery mental training method had a better impact in increasing the forehand serve accuracy. This is in line with Glisky et.al's opinion, as cited in Q.H Yu et.al (2015: 2), which mentioned that internal imagery training is more beneficial when compared to the external imagery training if it is used for developing the movement technique and strategy. Hale (Ollson, 2008: 12) also mentioned that the internal imagery training is also better in triggering psychological response. This psychological response is able to produce more endorphin hormones so that it has a calmer and more comfortable effect on athletes or players in carrying out their duties.

Based on some of the above theories, it is known that internal imagery training has many advantages over external imagery training. The internal imagery training method had some advantages, such as improving the psychological response, and it is simpler and can better optimize the athletes' movement. Thus, it can be concluded that that internal imagery mental training is better in improving athletes' performance.

b. The Effect of High and Low Concentrations on The Accuracy of Forehand Serve

The analysis results showed that athletes who had high concentration level were better in terms of forehand serve accuracy than those who had low concentration level. In this case, concentration has an important role which can affect a technique or the result of a match. Attention and concentration are often misinterpreted as the same thing, but in fact they have different meaning.

According to Sukadiyanto (2006: 161) attention is a process of direct awareness of information (stimulation) received to decide an action (response).

Meanwhile, concentration is a person's ability to focus on a selected stimulus (one object) within a certain time. According to Schmid & Peper (Satidarma, 2000:228) that concentration is very important for an athlete to show his performance on the field. The main component of concentration is the ability to focus on a particular subject and not be distracted by internal stimuli or irrelevant external stimuli. This is consistent with research conducted by Agustina and Priambodo (2017) which states that there is a significant difference between the level of concentration and the accuracy of shooting petanque sports.

c. Interaction between Training Methods (Imagery Internal Perspective and Imagery External Perspective) and Concentration (High and Low)

Imagery ability is the ability to conceptualize motor performance. Imagery will be more effective if individuals have higher imagery abilities. Individuals who have high concentration show a higher increase in motor performance compared to individuals

who have low concentration by using imagery exercises (Vealey in Firmansyah: 2011).

The results of this research proved that there was a significant difference between training methods (internal imagery and external imagery) and concentration (high and low) on the forehand serve accuracy of Sukoharjo Junior Table Tennis athletes.

From the results of the interaction form, it can be seen that the main factors of the study in the form of two factors show a significant interaction. There was a significant difference between internal and external method. The athletes who had high concentration and low concentration levels would perform better than athletes who were trained with the external imagery method.

It happened because, according to theory, internal imagery training would improve the athletes' concentration so that training method would be more effective if given to the players who had high concentration level. Athletes who had high concentration would be more effective if they were treated with internal imagery training because this type of training focuses target on a certain position when performing the forehand serve.

Thus, it can be concluded that the effectiveness applied to improve the accuracy of forehand serve was affected by the athletes' concentration level. Therefore, the training must be adjusted to the athletes' ability to optimize their maximum results.

IV. Conclusion

This research found out that there was a significant difference in the effect between the internal imagery training method and the external imagery training method on the forehand serve accuracy of the table tennis athletes; there was a significant difference in the effect between high and low concentration levels on the forehand serve accuracy of the table tennis athletes; and there was a significant interaction between the two imagery training methods (internal imagery and external imagery) and concentration (high and low) on the accuracy of forehand service in table tennis athletes.

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