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The Analysis of Mental Imagery Functions in Badminton for Novice Athletes

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Abstract : The present research was designed to compare the effect of mental imagery (MI) technique intervension based-on its function (cognitive and motivational) accompanied with physical practice on clear lob basic skill acquisition and self confidence. It was conducted toward 42 badminton novice athletes aged 10-12 years old, consist of 21 boy and 21 girl athletes derived from Badminton Schools in Bandung. The participant were assigned in two experiment groups and one control group by group random assignment. Both experimental group participated in twelve sessions of MI practice and clear lob basic skill acquisition, meanwhile control group participated in clear lob basic skill acquisition only. The result of data analysis indicated that cognitive-MI group produced better results in clear lob basic skill acquisition compared with motivational-MI group, and vice versa, the motivational-MI group produced higher results in self-confidence compared with cognitive-MI group. In general, all experimental groups indicated higher result in clear lob basic skill acquisition and self-confidence compared with control group, and there is a positive correlation between clear lob basic skill acquisition with self-confidence.

Keywords : Mental imagery, cognitive, motivational, clear lob, self confidence.

1. INTRODUCTION

Clear lob or defensive lob is included in one of the basic skills of hitting in a badminton game which first must be learned and mastered by novice athletes. Every badminton player must master the clear lob-BS, because it is one of the most important types of hitting and the most often used in a single match, the basis for the development of other types of hitting, to be very useful to get back into ready position, to make the opponent difficult to attack and to be the early barometer for an athlete's ability to be categorized as having been able or having not been able to play badminton at the most basic level that is able to take across the shuttle cock over the top of the net to the opponent's court (Hidayat, 2012). To be able to show clear lob well not only needs physical exercises and techniques but also needs psychological skills training, one of them is a method or technique of mental imagery.

Mental imagery (MI) is "using all the senses to create or recreate an experience in the mind" (Vealey & Greenleaf, 2001, p.248), MI is one of the methods or techniques of mental training (Vealey, 2007), and therefore it is an integral part of a psychological skills training program (Weinberg, 2008). Athletes use MI in sporting activities for diverse functional interests associated with atheirperformance, among others, to improve sports performance (Murphy, Nordin, & Cumming, 2008; Hidayat, 2010), increase motivation (Cumming, Hall, Harwood, & Gammage, 2002), increase the confidence (Callow, Hardy, & Hall, 2001; Short, Bruggeman, Engel, Marback, Wang, Willadsen, & Short, 2002; Mamassis & Doganis,

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2004; Callow, Roberts, Fawkes, 2006), and reduce anxiety (Evans, Jones, & Mullen, 2004), which can be used as a solitary (Nicholls, Polman, & Holt, 2005; Watt, Spittle, Jaakkola, & Morris, 2008; VaezMousavi & Rostami, 2009) or in combination with other techniques of psychological skills in one intervention program package, for example combined with goal setting (Lerner, Ostrow, Yura, & Etzel, 1996; Hidayat, 2011), with self-talk (Cumming, Nordin, Horton, & Reynolds, 2006; Ahmed, 2010; Afsanepirak & Bahram, 2012; Afsanepirak & Bahram, Dana, & Abdi, 2012; Whitbread & Newel, 2013), with the goal setting and self-talk (Hanton & Jones, 1994), with goal setting, positive thinking and self-talk, concentration and routines, arousal regulation techniques (Mamassis & Doganis, 2004), with relaxation, goal setting, concentration, and self-talk (Pavlidou & Doganis, 2008), with self-talk and relaxation (Thelwell, Greenless, & Weston, 2010).

Taxonomy of MI applicative functions consists of cognitive and motivational functions (Paivio, 1985). Cognitive function is related to cognitive variables of the process and strategies of learning skills and sports performance, while the motivational function is with respect to the motivational variables of the process of learning and sporting appearance, such as motivation, self-confidence, arousal, and anxiety. Furthermore, Hall, Mack, Paivio, & Hausenblas (1998) operationally divide both the MI functions into several categories, namely cognitive specific imagery (CS-I used to imagine the specific motor skills), cognitive general imagery (CG-I used to imagine playing strategy), motivational specific imagery (MS-I associated with visualizing specific goals and the goal-related activities), motivational general-arousal (MG-A associated with the management of arousal and anxiety levels), motivational general-mastery (MG-M related with the enhancement of mental aspects to remain resilient, more confident, stay focused, and stay positive).

Empirical evidence on the effectiveness of MI cognitive and motivational functions remains inconsistent (VaezMousavi & Rostami, 2009; Alikhani, VaezMousavi, & Mokhtari, 2011). Some research shows cognitive-MI is more effective than motivational- MI (Hall, et al., 1998; Cumming & Ste-Marie, 2001; VaezMousavi & Rostami, 2009), motivational-MI is more effective than the control group (Feltz & Riessinger, 1990; Lee, 1990; Callow, Hardy, & Hall, 2001), motivational-MI does not give a different effect to the control group (Jones, Bray, Mace, Race, & Stockbridge, 2002; VaezMousavi & Rostami, 2009), cognitive and motivational-MI does not give different effects (Burhans, Richman, & Bergey, 1998; Short, et al., 2002; Alikhani, et al., 2011).

In addition to the inconsistencies, the studies conducted are still relatively limited in young and adult elite athletes using a small sample (idiographic) and the complexity of movement in the advanced or proficient level, while the MI intervention in child athletes, among others, is performed by Li-Wei, Qi-Wei, Orlick, & Zitzelsberger (1992), Mamassis, & Doganıs (2004), Munroe-Chandler, Hall, Fishburne, & Shannon (2005), Munroe-Chandler, Hall, Fishburne, Murphy, Hall (2012), and the child beginner athletes (Hidayat & Yapsir, 2005; Veraksa & Gorovaya, 2011; Kerkez, Kulak, Aktas, 2012), is still relatively limited, especially in the badminton sport. Even in Indonesia as one of the "most powerful country" in the badminton sport, studies associated with two MI functions are very hard to find, or may not yet be available.

In accordance with the main points of the above description, this study aimed to examine differences in the level of mastery clear lob-BS and self-confidence based on treatment variations in cognitive-MI function, motivational-MI, and combinational-MI exercise combined with the mastery of clear lob-BS, and no MI (just exercises on the mastery of clear lob-BS) in child beginner athletes aged 10-12 years at the badminton clubs/schools in Bandung of West Java. It was assumed that overall MI regardless of its function would provide a significant influence on clear lob-BS acquisition and self-confidence (hypothesis 1), cognitive-MI provided a higher influence on the acquisition of clear lob-BS compared to the motivational-MI (hypothesis 2), and motivational-MI had a differr influence on self-confidence compared with cognitive-MI (hypothesis 3).

2. RESEARCH METHOD

Participants

The number of the participants was 56 novice badminton athletes aged 10-12 years (M = 10.56; SD = .49), consisting of 28 boy novice athletes (M = 10.62; SD = .51) and 28 girl novice athletes (M = 10.66; SD = .47) coming from school / badminton club in Bandung. All participants were selected and determined by using disproportional stratified sampling and random assignment techniques and were divided into two experimental groups and one control group. Inclusion criteria for athletes who could be the participants in this study were (1) boy and girl athletes, (2) listed as an athlete in badminton club / school in Bandung of West Java, (3) aged between 10-12 years, (4) included as a group of novice players who had been practicing between 1-3 months, (5) willing to be involved during the research process by fill in an informed consent.

3. MEASURES

Clear lob-BS test

The purpose of clear lob-BS test is to measure the accuracy of a hit with the direction of a suttlecock really soaring up to the opponent's back field and the cock falls on a predetermined target area. In a test of classification skills, clear lob-BS test includes objective type test group of Accuracy-Based Tests, as described by Morrow, Jackson, Disch, & Mood (2005, p.315) that "Accuracy-based skills test usually involve the skill of serving an object, such as a volleyball, tennis ball, or badminton shuttlecock. They may also involve some other test of accuracy: throwing in football or baseball, free throws or other shots in basketball, or kicking goals in soccer". This test was first developed by the Centre for Childhood Badminton Development and Training BM 77 Bandung (1995/1996), later modified by Hidayat (2011) with the magnitude of the criterion-related validity index of .74 and test-retest reliability of .90. The analysis of trials associated with this study resulted in the criterion-related validity index estimates of .70 and test-retest reliability estimate of 0.81. In this test, each athlete performed 12 times of hitting clear lob-BS, respectively six times of hitting of the left and right half area and measured by the number of successful hit and the shuttlecock that fell to the target field with a score of 0, 1, 2, or 3.

Badminton self-confidence scale

Badminton self-confidence scale was a multidimensional scale that measures the level of confidence to the athlete's ability to succeed in making clear lob-BS test after doing the exercises for six weeks (12 sessions). Scale development was based on multi-dimensional model of self-confidence developed by Vealey and Knight (2002) that this was further integrated into a conceptual model of self-confidence in sports (Vealey & Chase, 2008), consisting of a type or sub-scale of confidence in SC-cognitive efficiency, SC-physical skill and training, and SC-resilience. The results of the analysis of trials using the technique of factor analysis to 144 respondents obtained 35 valid items with factor loading values ranging from 0.52 to 0.82, consisting of 14 items of sub-scale SC-cognitive efficiency (loading factor of 0.50 to 0.81), 8 items of sub-scale SC-physical skill and training (loading factor of 0:55 to 0.85), and 13 items of sub-scale SC-resilience (loading factor of .50 to .76). The results of the analysis of internal consistency reliability estimates obtained Cronbach alpha score of SC-Scale of .90, BSC-cogntive efficiency of .75, BSC-physical skill and training of .71, and BSC-resilience of .78.

MI Manipulation check

Manipulation check was conducted to determine the use of MI techniques by athletes during training process through a set of specific questions prepared in accordance with the requirements at the time of the intervention (Callow et al., 2001; Evans et al., 2004). Manipulation check of the meeting given after each intervention; the athlete had to answer several questions related to the understanding of how to conduct MI (easy or not to imagine), the clarity and the ability to control the imagined object before or after training (content and perspective) in accordance with the guidelines in the script, and imagining training

effectiveness (Callow and Waters, 2005; Callow et al., 2006; Cumming and Ste-Marie, 2001; Munroe-Chandler et al., 2004, 2005; Ramsey et al., 2007) in relation to the control of movement and training motivational aspects (more encourageous, more confident, and calmer).

Design

The independent variable of this study was the variation of MI function, consisting of categories of cognitive-MI and motivational-MI combined with the training on the acquisition of clear lob-BS, while the dependent variables were the acquisition of lob-BS clear and self-confidence. These two categories of independent variables were manipulated to be tested the difference influence against both dependent variables, and also compared with the control group. For the purposes of manipulation, then used "pretest-posttest control group design with more than one experimental group" was used (Johnson & Cristensen, 2012, p.304). In accordance with this design, all groups were assigned randomly into three experimental groups and one control group, and then performed the initial tests of clear lob-BS in all groups, followed by administration of manipulation in accordance with each variation for 12 sessions (three times a week) and one day after the completion of manipulations the final test was performed.

4. PROCEDURE

The research procedure was divided into stages of education, training, and evaluation (Vealey & Greenleaf, 2001; Weinberg & Gould, 2007). Education stage contained two activities, namely modules socialization and MI training program in the form of workshops with coaches for three days and face to face meetings with athletes to desseminate MI intervention programs in learning the basic skills of playing badminton for three meetings and each meeting lasted for 10 minutes (Hidayat & Wirawan, 2005). The training phase is the implementation of the intervention program or the provision of treatment for six weeks (12 sessions / three times a week) and each meeting was held for 135 minutes. The structure of the exercise program was divided into three stages, namely opening for 30 minutes (containing activities of checking attendance, explanation of exercise goals, demonstration of clear lob-BS, MI external exercise and warming up), core training for 80 minutes (containing training activities of clear lob-BS acquisition and games training of half field), and closing for 25 minutes (consisting of internal MI training, MI manipulation checks and cooling down activities). In accordance with the categorization of MI functions and control groups, then there were three research groups, namely: (1) EG-1 getting treatment of cognitive-MI and clear lob-BS acquisition training, (2) EG-2 doing motivational-MI and clear lob-BS acquisition training, (3) CG doing clear lob-BS acquisition training. Evaluation phase consisted of activities of clear lob-BS measurement before starting an intervention program (pre-test) and immediately after the program was completed (post-test), as well as filling in the self-confidence badminton scale.

Conceptual approach used to develop MI scripts was a conceptual framework of MI Four Ws: Where, When, What, Why) and also the concept of "how". Where and when athletes use MI, why athletes use MI, what objects / events athletes would imagine in MI, and how MI scripts are given and developed. In relation to this study, MI was given in the exercise situation (Where), *ie*, before, while waiting to exercise, and after exercise (When), MI was given to cognitive and motivational functions (Why), each MI training session was conducted ≤ 10 minutes, in the form of positive MI, on the vividness and controllability dimension, both visual and kinesthetic type of MI, MI object imagined was part by part of movement and overall range of motion (cognitive-MI), specific goal or goal-related activities, the situation when controlling the tension or anxiety, and situations when managed to perform properly / motivational-MI (What), and MI scripts media of tape-recorder and use of the keywords as markers (cue) of object imaginable in accordance with applicative concept of BBS contruct (How). At each early MI training session, the participants were in the relaxed state, the supine position (anatomical state) or sit on badminton court, and begin with a basic MI training.

Statistical analysis

Analysis technique of MANOVA of one factor was used to test for differences in the effect of the type of MI function to clear lob-BS acquisition and self-confidence, because MANOVA is a statistical procedure to determine group differences on multiple dependent variables (Biddle, Markland, Gilbourne, Chatzisarantis, & Sparkes, 2001; Field, 2009; Wijanarko, 2010) as a result of several independent variables either jointly or individually. Besides MANOVA, one-way ANOVA analysis technique was also used to determine differences in the effect of the experimental group with the control group, analytical techniques of two mean differences (t-test) to test for differences of clear lob-BS acquisition and self-confidence based on gender, and analysis technique of simple correlation to test the correlation between clear-BS lob acquisition and self-confidence

5. RESULTS

Preliminary analysis

Preliminary analysis was used to determine the presence or absence of group differences in demographic variables of gender and duration of training, as well as the initial skill of clear lob-BS acquisition. This analysis was used to ensure that the significance of the difference in the dependent variable was not caused by differences in the variation in the three variables, but only due to differences in treatment variations. The results of the analysis are presented in tables 1 and 2 below:

Table 1
Means and standars deviations of age, experience of training, and pretest for each group (cognitive, motivational, combinational, and control)

Groups	*Partisipant*	*Age*		*Experience of Training*		*Pre-test*	
		M	*SD*	*M*	*SD*	*M*	*SD*
Cognitive-MI (EG-1)	Boy athletes	10.75	0.62	2.29	0.49	13.00	1.07
	Girl athletes	10.46	0.42	2.50	0.55	13.50	1.07
Motivational-MI (EG-2)	Boy athletes	10.56	0.43	2.14	0.38	12.88	1.73
	Girl athletes	10.86	0.52	2.50	0.53	13.25	1.04
Control (CG)	Boy athletes	10.79	0.60	2.29	0.49	13.50	1.31
	Girl athletes	10.76	0.52	2.14	0.90	12.75	.89

Table 2
The Results of One-Way ANOVA to Compare Mean of Age, Experience of Training, and pretest of Partisipant on each Group

Group	*Age*				*Experience of training*				*Pre-test*			
	M	*SD*	*F*	*P*	*M*	*SD*	*F*	*P*	*M*	*SD*	*F*	*P*
Cognitive-MI	10.60	.53	.20	.81	2.21	0.43	0.53	0.95	13.29	1.06	0.42	.66
Motivational-MI	10.62	.44			2.21	0.69			12.93	.99		
Control	10.71	.51			2.29	0.82			13.21	1.18		

The results of one-way ANOVA proved to have no significant difference in the age of the participants in each group, F (2.39) = .20, ρ = .81; there was no significant difference in the experience of participants in each group, F (2.39) = .53, ρ = .95; and also there was no difference in the results of the participants' pretest on each group, F (2.39) = .42, ρ = .66.

6. MAIN ANALYSIS

Statistic Descriptive

Table 3
The result of statistic descriptive (means and standars deviations of post test for each group (cognitive, motivational, and control)

Dependent Variabel	*Group*	*Mean*	*SD*	*N*
Clear lob-BS acquisition	Cognitive-MI (Experimen Group-1)	27.21	0.69	14
	Motivasional-MI (Experimen Group -2)	22.79	0.97	14
	No-MI (Control Group)	18.00	1.84	14
	Total	22.67	4.00	42
Self-confidence	Cognitive-MI (Experimen Group-1)	74.57	1.28	14
	Motivasional-MI (Experimen Group-2)	82.07	1.07	14
	No-MI (Control Group)	64.29	2.67	14
	Total	73.64	7.59	42

Multivariate and univariate significance test of between-subjects effects

Multivariate significance test was used to test whether each category level of MI function (cognitive-MI, motivational-MI, and combinational-MI) affected the dependent variables. SPSS gave four types of multivariate significance tests, *ie*, Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root. The Hotelling's Trace was typically used for two groups of dependent variables and Wilks' Lambda was used if there were more than two groups of dependent variables. The univariate significance tests of between-subjects effects was used to test the influence of ANOVA univariate for each level of the category on the dependent variable. The results of of the complete analysis of multivariate and univariate significance tests of between-subjects effects are presented in tables 4 and 5 below.

Table 4
The Result of Multivariate Significance Tests

Effect		*Value*	*F*	*Hypothesis df*	*Error df*	*Sig.*	*Partial Eta Squared*
Group	Pillai's Trace	1.785	162.301	4.000	78.000	.000	.893
	Wilks' Lambda	.007	200.669[b]	4.000	76.000	.000	.914
	Hotelling's Trace	26.675	246.741	4.000	74.000	.000	.930
	Roy's Largest Root	21.816	425.416[c]	2.000	39.000	.000	.956

Table 5
The result of Univariate Significance Tests of Between-Subjects Effects

Source	*Dependent Variable*	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Group	Clear lob-BS aquisition	594.619	2	297.310	184.887	.000	.905
	Self confidence	2232.429	2	1116.214	336.900	.000	.945
Error	Clear lob-BS aquisition	62.714	39	1.608			
	Self confidence	129.214	39	3.313			

The result of the multivariate significance tests of the Hotelling's Trace showed Ftest value of 246.741 and $\rho = .00 < .05$. This means that MI had a very significant impact on the clear lob-BS and self-confidence aquisition with a magnitude variability of 93.0% indicated by a value of partial eta squared (η^2) of .930. The results of the univariate significance tests of between-subjects effects showed: (1) MI to provide a very significant influence on the clear lob-BS aquisition with the amount of value FoA (2.39) = 184.887, $\rho = .00 < .05$, and a value of PES variability (η^2) was .905; (2) MI to provide a very significant influence on self-confidence with a value of FoA (2.39) = 336.900, $\rho = .00 <. 05$, and a value of PES variability (η^2) was .945.

Pairwise comparisons test

The results of pairwise comparisons test among groups for clear lob-BS aquisition showed that cognitive-MI (M = 27.21) to give higher and significant effects than the motivational-IM (M = 22.78), $\rho = .00 < .05$; (2) The results of pairwise comparisons test among groups to self-confidence showed that motivational-IM (M = 82.07) to give higher and significant effect than cognitive-IM (M = 74.57), $\rho = .00 < .05$.

Experiment-control group comparisons

Table 6
The result of experiment-control group camparison on clear lob skill acquisition and self confidence

Number	*Comparated group*	*ρ _Value*	*α*	*Note*
Clear lob-BS acquisition				
1.	Cognitive-MI (EG-1) with No-MI (Control Group)	.00	.05	Significant
2.	Motivaional-MI (EG-2) with No-MI (Control Group)	.00	.05	Significant
Self confidence				
1.	Cognitive-MI (EG-1) with No-MI (Control Group)	.00	.05	Significant
2.	Motivaional-MI (EG-2) with No-MI (Control Group)	.00	.05	Significant

The results of one-way ANOVA analysis to clear lob-BS aquisition showed no significant differences between the experimental groups and the control, N = 42, M = 22.67, SD = 4.00, nilai F (2,39) = 184.887, ρ = .00 < .05 . Similarly, for the variable of self confidence, there was a significant difference between the experimental group and the control, where N = 42, M = 73.64, SD = 7.59, nilai F (2,39) = 336.900, ρ = .00 < .05. Furthermore, the results of further test comparison between the experimental group and the control group using the Tukey test are presented in Table 6 as follows.

The results of Tukey test analysis on the comparison between all experimental groups and the control group as shown in Table 3 above earned a ρ value of .000 <.05, meaning that all the experimental groups gave significant and higher effects than the control group both in clear lob skill acquisition and self confidence.

Dependent variable correlation

The results of the calculation of Pearson correlation between clear lob-BS aquisition (N = 42; M = 22.64; SD = 4.01) and self-confidence (N = 42; M = 73.79; SD = 7.71) found that overall there was a positive correlation between clear lob-BS aquisition and self confidence with a value of the correlation coefficient of .569 and significance at.00 <.05. In boy athletes, there was a positive correlation between clear lob-BS aquisition (N = 21; M = 22.80; SD = 4.00) and self-confidence (N = 21; M = 73.90; SD = 7.52) with the magnitude of the correlation coefficient of .653 and significance at 0.00 <.05. As for the girl athletes, this analysis proved there was a positive correlation between clear lob-BS aquisition (N = 21; M = 22.57; SD = 4.05) and self-confidence (N = 21; M = 73.52; SD = 7.94) with a correlation coefficient of .440 and significance at.00 <.05.

MI Manipulation check

MI Manipulation check was intended to determine the extent to which the athlete could perform MI. Each completed training session, the participants were asked to answer some questions as follows:

- Do you know about the use of training to imagine in practice today?
- After seeing the demonstration of the coaches, images, or movies, can you imagine movement that you will learn clearly?
- Are you able to imagine the movement correctly in accordance with the movement exhibited by the coach or the movement you see in the image / movie?
- After doing the training, can you re-imagine the movement you have learned during the training clearly?
- After doing the training, can you re-imagine correctly in accordance with the movement that you have learned during the training?
- Is the training to imagine the movement you did useful to help master the lob clear-BS?
- Can the training to imagine the movement be beneficial to help increase your confidence that you have the ability to perform movements properly?

The results of the analysis are presented in Table 7 below:

Tabel 7

Result of MI Manipulation Check Analysis

Item of Manipulation Check Analysis	*Category*	*M ± SD*	*%*
Item_1 (Degree of difficulty)	Difficult	1.09 ± 1.54	7.80
	Moderate	4.97 ± 1.38	35.5
	Easy	7.94 ± 1.92	56.7
Item_ 2 (vividness before training)	Clear	7.89 ± 2.04	56.3
	Less clear	5.34 ± 1.58	38.1
	Not clear	0.77 ± 1.07	5.50
Item 3 (controlability before training)	Controlled	7.68 ± 1.54	54.8
	Less controlled	5.35 ± 1.29	38.2
	Not controlled	0.97 ± 1.37	6.90
Item 4 (vividness after training)	Clear	7.71 ± 2.08	55.1
	Less clear	5.21 ± 1.43	37.2
	Not clear	1.08 ± 1.76	7.70
Item 5 (controlability after training)	Controlled	7.75 ± 2.15	55.4
	Less controlled	5.71 ± 1.57	40.8
	Not controlled	0.54 ± 0.90	3.90
Item 6 (effectiveness for clear lob-BS acquisition)	Useful	7.25 ± 1.47	51.8
	Sometimes	6.00 ± 1.11	42.9
	Not useful	0.75 ± 1.22	5.40
Item 7 (effectiveness for improving self confidence to perform clear lob-BS)	Useful	7.67 ± 1.36	54.8
	Sometimes	5.25 ± 1.39	37.5
	Not useful	1.08 ± 1.44	7.70

7. DISCUSSION

The purpose of this study was to examine differences on the influence of cognitive-MI and motivational-MI function to clear lob-BS acquisition and self confidence for badminton beginner athletes aged 10-12 years. The results of the general analysis proved that clear lob-BS acquisition and self confidence of athletes who used MI techniques was higher than athletes who did not use MI technique. The results of the analysis were in accordance with the results of previous studies on MI function as mental training techniques that could facilitate the improvement of sports performance (Murphy, et al., 2008; Hidayat, 2010); this was shown to promote hockey penalty flick performance (Smith, et al. , 2001), biathlon shooting performance (Groslambert, et al., 2003), golf chip shots hit (Nicholls, Polman, & Holt, 2005), basketball free throw shooting (Post, Wrisberg, & Mullins, 2010), basketball lay-up-shot coordination and movement accuracy (Gaggioli, Morganti, Mondoni, and Antonietti, 2013); this was positively correlated with the development

of the mental aspects such as confidence, motivation, and anxiety (Short, et al., 2002; Wienberg, 2008). In child athletes, this was proven to improve topspuns and underspuns skills of Chinese table tennis elite athletes aged 7-10 years (Li-Wei, et al., 1992), enhance self confidence and tennis performance, as well as managing anxiety (Mamassis, & Doganıs, 2004), and improve the range of movement skills of children aged 9-10 years (Doussoulin & Rehbein, 2011), tennis serve performance (Guillot, Desliens, Rouyer, and Rogowski, 2013), specifically in child beginner athletes this proved to increase clear lob and high service performance (Hidayat, 2011), soccer skill performance (Veraksa & Gorovaya, 2011; Kerkez, et al., 2012), and learning of new skills in novice volleyball players (Afrouzeh, Sohrabi, Torbati, Gorgin, and Mallett, 2013).

Based on the theoretical framework of applicative MI function that describes how MI affects the appearance of human motion (Paivio, 1985), MI is divided into two cognitive and motivational functions, each dimension function divided into general and specific functions. So there are four dimensions of MI function, namely the function of cognitive specific imagery/CS-I, cognitive general imagery/CG-I, motivational specific imagery/MS-I, motivational general imagery/MG-I, and in its development Hall, et al., (1998) divides the functions of MG-I into motivational general-arousal imagery/MG-A and motivational general-mastery/MG-M. In accordance with the two main functions, MI can be used to facilitate the development of human movement skills and motivational aspects development, either solitary or together. As described by Alikhani, VaezMousavi, and Mokhtari (2011, p.792), "cognitive role of MI has a relationship with cognitive variable learning while motivational role of MI has relationship with motivational variable such as arousal and activation". Thus, according to the results of this study, the results of other relevant studies and also applicative theoretical framework above, explicitly it can be explained that there is a causal link between MI co-variation and mastery and appearance of clear lob-BS. Theory approach to support these findings, among others, states that there are subliminal electrical activities in muscles during an individual doing MI and the activities are the same as muscle activity during the actual motion demonstration, but in a smaller amount (Psychoneuromuscular Theory: Jacobson, 1931; research results of Slade, Landers, & Martin, 2002: Smith & Collins, 2004; Hidayat, 2011). In addition, it is believed that MI also serves as an encoding system that can help athletes to understand and master the movement patterns (Symbolic Learning Theory, Sacket, 1934; research results of Vealey & Greenleaf, 2001; Feltz & Landers, 1983; SooHoo, Kimberly, Takemoto, & McCullagh, 2004). Hidayat (2011, p. 138) states that the mental imagery training helps pupils create mental blue print and develop mental plan about ways to perform motor skill that they will learn.

Other findings indicate that cognitive-MI provides a higher and significant effect on the clear lob-BS acquisition compared to the motivational-MI. The findings of this study are relevant to the results of previous studies such as the increase in running speed (Burhans, Richman, & Bergey, 1998) and mastery of free throws in basketball game (VaezMousavi & Rostami, 2009). These results confirm the cognitive-MI function as a technique or mental exercise method in two functional categories, namely cognitive specific-imagery/CS-I and cognitive general-imagery/CG-I. CS-I is used to develop and perform movement skills; athletes train imagining specific motor skills during a practice or game clearly and precisely. The development of skills is related to learning skills technically and also how to fix it, while doing motor skills is with respect to efforts to perform the skills of motion as good as possible in a given situation. CG-I is used to develop a method, technique, or strategy of play (Munroe, et al., 2000), divided into strategies to develop, conduct, and predict the movements to be performed.

Cognitive-MI proved to be effective to improve motor skill acquisition (including clear lob-BS acquisition in athletes 10-12 year olds), because cognitive-MI helps athletes to review the symbolic aspects, perceive patterns of movement, codify movement needed to display skills in the brain, and develop exercise programs in the central nervous system (Feltz & Riessinger, 1990; Martin, Moritz, & Hall, 1999; Magil, 2004). Cognitive-MI is also effectively used in developing exercise strategies because cognitive-MI helps athletes focus on key aspects of movement and direct athletes' attention on key aspects

of learned motor skills (VaezMousavi & Rostami, 2009). More specifically, McMorris (2004) believes that cognitive-MI can help athletes create a model in the central nervous system, and therefore, when athletes learn to imagine a movement skill, as if these athletes were showing actual movement.

The analysis also found motivational-MI function gave different effects either with cognitive-MI group and the control group. It was proven motivational-MI function provided a higher effect on confidence than cognitive-MI function and control groups. These findings were relevant to previous findings (Feltz & Riessinger, 1990; Lee, 1990; Callow, Hardy, & Hall, 2001), and inconsistent with the results of research conducted by Jones, Bray, Mace, Race, and Stockbridge (2002), VaezMousavi & Rostami (2009), Burhans, et al. (1998), Short, et al. (2002), and Alikhani, et al. (2011). These results illustrated the effectiveness of motivational-MI function in the three categories of functions, *ie*, motivational specific-imagery/MS-I functions to imagine specific goals and behaviors directed at the goal; general-arousal/MG-A motivational function to control arousal and anxiety at the time of training and competition; and motivational general-mastery/MG-M functions to improve the readiness of mental aspects such as motivation, self-confidence, positive attitude, and others. In addition, the results of this study reinforced the consistency of the causal relationship between motivational-MI and confidence from the perspective of social-cognitive theory (Bandura, 1997) and the conceptual model of self-confidence (Vealey, 1998, et al., 2007). MI is a source of self-efficacy or confidence and is classified as imaginal experiences (Maddux in Machida, 2008). Several studies corroborating this theoretical concept, among others, were performed by Calmels & Fournier (2001) and Short, et al. (2002).

The analysis also found a positive correlation between clear lob-BS acquisition and self-confidence, both overall and by gender. These findings corroborated the results of other studies (Marten, Vealey, & Burton, 1990; Vealey, 1986, 2001; Craft, Magyar, Becker, and Feltz, 2003; Woodman & Hardy, 2003). One conceptual framework that can be used to explain the existence of a correlation between clear lob-BS and self-confidence is the concept of feedback (Hidayat & Budiman, 2014). As known, clear lob-BS is basically a manifestation of mastery and demonstration of ability to provide feedback information about the success rate of performance (vicarious experience). High and low level of success will get external rewards in the form of social support that would affect the confidence level to be successful in subsequent performances. Vealey, Hayashi, Holman, & Giacobbi (1998) and Vallerand (2007) mention that mastery, demonstration of ability, vicarious experience, and social support are categorized as resources that can affect the confidence of athletes. In other words, the level of clear lob-BS acquisition will affect the confidence level of the athlete and vice versa.

8. CONCLUSION

The result of this study strengthens the evidence on the effectiveness of MI in sport settings, especially for badminton novice athletes aged 10-12 years. It was proven that MI as an integral part of PST, regardless of the function, supported higher and significant improvement in clear lob-BS and self-confidence than those who did not use MI (control group). Cognitive-MI had more effective influence on clear lob-BS than motivational-MI and not use MI, and, vice versa, motivational-MI had more effective influence on self-confidence rather than cognitive-MI and not use MI. It was also found that there was a positive correlation between clear lob-BS with self-confidence, either in a whole or partially in the novice boy or girl athletes.

According with the result, in practice, physical education teachers or coaches should teach their athletes how to use MI in order to help increase movement performance (especially clear lob-BS) and mental aspects (self-confidence). In order for the learning or training outcomes are optimal, PE teachers or coaches should choose and use the most suitable MI conceptual and practical approach by taking into consideration the following: (1) to develop MI scripts must be considerate a conceptual framework of MI Four WsH: Where, When, What, Why (Munroe, Giacobbi, Hall, & Weinberg, 2000; Munroe-Chandler, Hall, Fishburne, & Strachan, 2007) and also the concept of "how". Where and when athletes use MI, why athletes use MI, what objects / events athletes would imagine in MI, and how MI scripts are given and developed. (2)

In relation to this study, (a) MI was given in the training situation (Where), ie, before, while waiting to exercise, and after exercise (When), (b) MI was given to cognitive and motivational functions (Why), (c) each MI training session was conducted ≤ 10 minutes, in the form of positive MI, on the vividness and controllability dimension, both visual and kinesthetic type of MI, MI object imagined was part by part of movement and overall range of motion (cognitive-MI), specific goal or goal-related activities, the situation when controlling the tension or anxiety, and situations when managed to perform properly / motivational-MI (What), (c) and MI scripts media of tape-recorder and use of the keywords as markers (cue) of object imaginable in accordance with applicative concept of BBS contruct (How). (3) At each early MI training session, the participants were in the relaxed state, the supine position (anatomical position) or sit on badminton court, and begin with a basic MI training.

The limitation of this study is related to measurement of dependent variables. In the future study, retention test must be conducted (pretest--posttest--retention test). In addition, ability MI of the participants must be determined before the experiment to ensure result were not significantly influenced by difference in participants ability MI.

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