

Sports Massage to Improve the Immunoglobulin A (Iga) and the Hormon Beta Endorphin

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Keywords: Sports massage, high intensity, weight training, IgA, beta-endorphin

Abstract: Background: Massage may decrease muscle tension, accelerate blood circulation, increase nerve conductivity and hormonal changes, and increase immunity. Sports massage may also increase the level of beta endorphin (BE) hormone and immunoglobulin A (IgA) to accelerate the recovery of athletes. Objective: The aim of this study was to evaluate evidence of the effect of exercise massage on changes in IgA and BE hormone levels. Method: This research was an experimental research with the pre-test – post-test design. Research subjects were taken by inclusion: 1). 3rd year student of Sport Science Department, Yogyakarta State University, Indonesia, 2). Male students, 3). Healthy, and 4). Willing to be the subject of research. There were 18 students divided into 2 groups namely: treatment group I (K1), which was given sports massage, and group II (K2) as a control group, treated with placebo massage. The blood samples were taken through in vena cubiti of both control and experiment groups before and after treatment, and examined for the level of beta endorphin (BE) hormone and immunoglobulin A (IgA), by using instruments. The treatment for all the groups were physical exercises in the form of circuit weight training with 12 sessions and 10 repetitions/sets of 3 sets at high intensity for 60 minutes. After completion of circuit weight training, all samples were rested for 60 minutes. After the breaks, then all of the samples in each group were given 45 minutes massage treatment in the form of sports massage and placebo massage treatment for the group I and group II, respectively followed by resting for 60 minutes. Results: The exercise significantly increased the average IgA immune level by 36.22 mg/dl and beta-endorphin hormone levels by 1.65 ng/ml ($F > 0.05$). Conclusion: Sports massage to athletes performed heavy work and or exercise at high intensity could increase IgA and BE hormone.

1 INTRODUCTION

The massage is often undertaken to reduce the movement errors due to daily or exercise activities. The massage, including sports massage, is a massage that is specifically used or given to healthy people, especially sportsmen. The objects of sports massage are certain body parts of a healthy person. Manipulation is a method of gripping, which is a way of using the hands to adjust to certain areas of the body and also to give certain influences (Findley, 2010). The manipulation techniques that are often used in massage according to Paine (Paine, 2015) are *effleurage* (rubbing), *petrissage* (squeezing and pressing), *shaking*, *friction* (grinding), *tapotemen* (beating, hacking, clapping), *walken* (variations of rubbing), *vibration*, *stroking*, *skin-rolling* (folding the skin), *chiropractice* (tapping). Those

manipulation techniques are often used in sports activities. There are 9 types of manipulation taught in FIK UNY (Priyonoadi, 2011) namely *effleurage* (rubbing), *petrissage* (squeezing and pressing), *shaking*, *friction* (grinding), *tapotemen* (beating, hacking, clapping), *walken* (variations of rubbing), and *vibration*. In this study, the manipulation technique used only 9 kinds of manipulation, namely (rubbing), *petrissage* (squeezing and pressing), *shaking*, *friction* (grinding), *tapotemen* (beating, hacking, clapping), *walken* (variations of rubbing), and *vibration*.

Sports massage is known as a manual and manipulative therapy. This is a physical treatment mainly used in the *neuromusculoskeletal* system to treat pain and disability. The type and method of massage are preferred to make muscles relaxed and to improve the blood circulation for recovery

between training or high intensity competition sessions, reducing the possibility of tissue damage (Arroyo-Morales *et al*, 2009), decreasing heart rate, improving the blood circulation and pressure, reducing muscle tension, increasing joint motion, and reducing pain (Callaghan, 1993), as well as multidirectional changing in the metabolism of important biological compounds, improving the functional state of neuromuscular devices and activating energy production (Bykov *et al*, 2011). Therefore, the massage can help the athletes achieve the effective recovery.

Massage after an intense exercise may increase the IgA level (Saman *et al*, 2011). Similarly, (NCCAM, 2012) concluded that a Swedish massage session indicates a measurable biological effect and could have an effect on the immune system. As expressed by Major *et al* (Major *et al*, 2015), the provision of massage effleurage in mouse showed a trend of increasing the number of thymocytes in T cells in lymphoid organs increasing the IgA immune production. Similarly, massage affecting BE hormonal changes was seen in Fraser's and Cooper (Fraser & Cooper, 2009) and (Rokade, 2011) massage studies. BE hormone interferes the pain transmission by increasing the circulation of naturally-produced neurotransmitters in neural synapses in central nervous system pathways. Endorphins bind to the pre-synaptic membrane, inhibiting the release of substance P which may inhibit the transmission of pain, resulting in less pain.

It is possible that IgA immune and hormone levels BE levels can be used as a parameter to predict the health level of the body after experiencing high-intensity exercise, such as a circuit weight training. Therefore, the research about the benefit of sports massage to immunoglobulin A (IgA) and beta endorphin (BE) hormone levels need to be conducted.

2 METHODS

2.1 Research Instruments

The IgA immune level was examined by ELISA (Enzyme-Linked Immunosorbent Assay) method carried out by indirect sandwich using Siemen Healthcare Diagnostics Inc., (SIEMENS, 2008). Data were interpreted using Elisa Reader with 95% sensitivity.

The BE hormone level was examined by ELISA (Enzyme-Linked Immunosorbent Assay) method

carried out by the indirect sandwich using Peptide Enzyme Immunoassay (IEA, 2014). Data were interpreted using Elisa Reader with 95% sensitivity.

2.2 Research Subject

This experimental research was conducted using a pre-test post-test design (Sugiyono, 2013), (Sugiyono, 2014). The research subjects were 23 males and during the research process there were 5 subjects who could not continue the research, so that the entire subject was 18 males and healthy sport science students of Yogyakarta State University, Indonesia. Prior to the research, the subjects signed consent letters stating the willing to be the subject of research. During the research, the subjects divided into 2 groups, namely treatment (K1) and control (K2) groups. The K1 and K2 groups were treated with sport and the placebo massages respectively.

2.3 Procedure

All the groups (K1 and K2) took a preliminary test (pre-test). 7 mL of blood sampling of the subjects were taken from the cubital vein. The immunoglobulin A (IgA) and beta endorphin (BE) hormone levels of the blood were examined in the lab using instruments. The blood tests (post-test) were again undertaken after the subject finished activities including physical activity training that was a circuit weight training of 12 sessions and repetition 10 times / set as many as 3 sets at high intensity for 60 minutes. Workout load of each muscle was 30% from 1 RM, each session took 30 seconds, and the breaking interval between training sessions to another session was 60 seconds. The breaking interval between sets was 3-5 minutes. The breaking interval was used as a substitute for exhausting activities before being treated using massage. After resting for 60 minutes, 45 minutes sports massage was given to the group K1 and the placebo for group K2, and another 60 minutes rest. Measurements 1 and 2 were performed with the sample in the position of sitting. In the research process, there were 2 people who resigned because they were unable to continue the research and 4 participants with the extreme data results so that the total sample that could be analysed was 18. Data takers were experts of Prodia Laboratory located at Jl. Bintaran Kulon No. 28 Yogyakarta, and expert therapists (masseurs) were professional therapists from the FIK UNY Therapy Clinic.

2.4 Data analysis technique

Normality (Shapiro-Wilks), homogeneity (Levene test), and T-test of data were undertaken by using SPSS V.19.0 suit of program.

3.1 Description of Research Data

Immunoglobulin A (IgA) and beta endorphin (BE) hormone levels of pre-test and post-test were obtained and calculated to determine the gain scores (GS). The positive value (+) indicates the increasing Immunoglobulin A (IgA) and beta endorphin (BE) hormone levels after treatments. Statistic parameters of the data are given in Table.

3 RESULT AND DISCUSSION

Table 1: The Increase of IgA Immune Levels (mg / dl) in Experimental and Control Groups.

VARIABLE	EXPERIMENTAL GROUP			CONTROL GROUP		
Independent Variable	IgA		GS (Post-Pre)	IgA		GS (Post-Pre)
	POST	PRE		POST	PRE	
SPORT MESSAGE	337	302	35	192	194	-2
	307	258	49	388	361	27
	320	284	36	197	187	10
	237	208	29	307	298	9
	250	205	45	220	211	9
	242	214	28	178	174	4
	220	183	37	229	228	1
	304	259	45	209	213	-4
	276	254	22	316	325	-9
	Σ=		326	Σ=		45
	Mean		36.22	Mean		5.00
	Std. Dev		8.955	Std. Dev		10.512
	Min		22	Min		-9
Max		49	Max		27	

Table 1 describes the results of research on the Gain Score (GS) for the experimental group of sports massage on the IgA immune level with the total amount (Σ) of 326 mg/dl, the mean value (\bar{x}) of 36.22 mg/dl, standard deviation 8.955 mg/dl, the minimum value of 22 mg/dl, and the maximum value of 49 mg/dl. On the other hand, the GS on the

IgA immune level in the control group was the total amount (Σ) of 45 mg/dl, the average value (\bar{x}) of 5 mg/dl, the average value (\bar{x}) 5.00, and standard deviation of 10.512 mg/dl, with the minimum value of -9 mg/dl and the maximum value of 27 mg/dl.

Table 2: The Increase in BE Levels (ng/ml) in the Experimental and Control Groups.

VARIABLE	EXPERIMENTAL GROUP			CONTROL GROUP		
Independent Variable	BE HORMONE		GS (Post-Pre)	BE HORMONE		GS (Post-Pre)
	POST	PRE		POST	PRE	
SPORTS MESSAGE	9.52	8.53	0.99	14.83	14.98	-0.15
	11.15	9.37	1.78	7.97	7.41	0.56
	10.13	8.99	1.14	14.53	15.38	-0.85
	13.83	12.14	1.69	9.65	9.37	0.28
	14.03	11.5	2.53	13.63	13.07	0.56
	13.44	11.88	1.56	16.16	16.53	-0.37
	15.72	13.07	2.65	12.61	12.56	0.05
	11.1	9.46	1.64	13.5	13.76	-0.26
	11.32	10.42	0.9	8.64	9.1	-0.46
	Σ=		14,88	Σ=		-0.64
	Mean		1.6533	Mean		-0.0711
	Std. Dev		.61838	Std. Dev		.47745
	Min		.90	Min		-.85
Max		2.65	Max		.56	

Table 2 describes the results of research on the *Gain Score* (GS) for the experimental group of sports massage on the value of the BE hormone level with the total level (Σ) of 14.88 ng/ml and the average value (\bar{x}) of 1.6533 ng/ml, standard deviation .61838 ng/ml, minimum value of .90 mg/dl, and maximum value of 2.65 ng/ml. Whereas the GS level of BE hormone in the control group was gained the total score (Σ) of -0.64 ng/ml and the average value (\bar{x}) of -.0711 ng/ml, standard deviation of .47745 ng/ml with the minimum value of -.85 ng/ml, and the maximum value of .56 ng/ml.

3.2 Presentation of Test Results Test Requirements.

The normality test of immunoglobulin A (IgA) and beta endorphin (BE) hormone levels data indicates that data is normally distributed with $p > \alpha 0.05$.

The homogeneity test of immunoglobulin A (IgA) and beta endorphin (BE) hormone levels data is analysed by using the Levene's technique. It is obtained that $F > \alpha 0.05$, meaning the working hypothesis is rejected and the null hypothesis is accepted. Thus it can be concluded that the final Gain Score (GS) data of the population variants in the treatment group is homogeny.

Table 3: T-test

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Diff	Std. E. D	95% Confidence Interval of the Difference	
							Lower	Upper
GAIN SCORE IgA	Equal variances assumed	6.783	16	.000	31.22	4.603	21.46	40.980
	Equal variances not assumed	6.783	15.606	.000	31.22	4.603	21.44	41.000
GAIN SCORE BE	Equal variances assumed	6.622	16	.000	1.724	.2604	1.172	2.27651
	Equal variances not assumed	6.622	15.03	.000	1.724	.2604	1.169	2.27939

Based on the results of data analysis through the *Simultaneous Confidence Interval* presented in table 5, the confidence level was 95%. It can be argued that with a 95% confidence level there was an increase in the Iga and BE variables. The degree of changes in the increase of IgA was at the lowest level of 21.464 mmHg with the coefficient of 31.222 mg/dl, whereas the increase of BE hormone was at the lowest level of 1.17238 ng/ml with the coefficient of 1,72444 ng/ml.

Based on the presentation of the results of T-test data analysis in Table 5., the Gain Score (GS) data of the whole group of sports massage treatment and in the control group on the immune measurement test of IgA and BE hormone levels have been found significance $F > \alpha 0.05$, meaning the working hypothesis is rejected and the null hypothesis is accepted. So it can be concluded that the final Gain Score (GS) data: 1) Sports massage has a significant effect on elevated IgA immune levels; 2) Sports massage may have a significant effect on elevated levels of the hormone BE.

The results showed that: 1) Sports massages may increase the average IgA immune level by 36.22 mg/dl and have a significant effect of $F > 0.05$; 2) Sports massage may increase hormone levels to 1.65 ng/ml and have a significant effect due to $F > 0.05$.

3.3 Discussion

Agreeing with Tejero's statement (Tejero-Fernandez, Membrilla-Mesa, at al 2014), the best way to describe the practice of massage to mechanically manipulate body tissue was by applying rhythmic pressure. Furthermore, Field et al. (Field, Diego, Hernandez, 2010) stated that one of the mechanisms giving to massage impacts is by stimulating mechanoreceptors nervous system found in the skin (eg. Meissner and Pacinian corpuscles, Merkel disc tip, Ruffini and free nerve endings). The pressure applied to the receptors activated pathways that send signals along nerve fibres and myelin to limbic regions of the brain (Sliz, Smith, Wiebking, Northoff, Hayley, 2012) or affected the release of such substances P or serotonin considered responsible for mediating 'relax' (Listing, et al. 2010). These suggested that emotion and neuronal modulation were key elements for the effectiveness of massage therapy. Major et al believed catecholamine released in lymphoid organs under central nervous system control was known as regulators of the immune repertoire.

The mediation of massage increases catecholamine. Banker (Banker, Christine, Waters., 2013) stated that the effleurage massage to rats may

significantly decrease fluorescence intensity in both the cortical and cortico-medullary intersections. This is in line with the opinion of Herman et al (Herman, Poindexter et al 2012) that the large noradrenergic nerve plexus predominates in the subcapsular cortex and the corticomedullary junction, where reside thymocytes are more mature. Reinforced by Major's research previous studies conducted on human's show that the effleurage massage enhances vagal activity through stimulation of pressure receptors which in turn signals the limbic system reduces norepinephrine release in the bloodstream causing regulation of overall sympathetic activity. Interestingly, Major's research and other research groups have shown sympathetic nerves that lymphoid innervate tissue as one of the major pathways of the nervous and immune systems communicate to maintain body homeostasis (Diego *at al*, 2009), (Field, 2008), (Pilipovic *et al*, 2012), (Leposavic *at al*, 2011), (Leposavic & Perisic, 2008)

The results of the above analyses indicate that sports massage can increase the immune IgA levels physiologically due to the result of treatment of manipulation in sports massage as much as 9 (nine) repetitions beginning with effleurage manipulation, petrissage (squeezing and pressing), shaking, friction, beating, hacking, clapping, walking, vibration and closing with effleurage manipulation leads to smoothening of the circulatory system that delivers the build-up of lactic acid and carbon dioxide and increases oxygen levels to help the process of energy formation in muscle cells within the mitochondria. This smooth blood circulation will stimulate the endocrine system in the thymus gland to produce the thymocytes and in the liver and bone marrow produced lymphocytes consisting of B cells and T cells circulated through blood and lymph nodes to the mucosal epithelial tissue of mucous membranes, including mucus, saliva, and tears and mucosal tissue in the respiratory and digestive tracts that trigger to produce IgA immunity (Barrett *at al*, 2010), (Wiaro, 2012). So sports massage is highly recommended to be given to athletes in order to increase the levels of IgA is very high useful as immune in the body. Meanwhile sports massage can increase levels of hormones BE physiologically due to the impact of treatment on sports massage as much as 9 (nine) repetition that resulted in the influence on a good in nerve system, it turns out that this repetitive manipulation stimulus is responded to by larger A-beta fibres, so this stimulus reaches the brain first, thereby closing the pain gate so that pain perception does not arise. In addition, the stimulation provided to stimulate the body's natural

morphine expenditure is the hormone endorphin by stimulating the sensory nerve receptors to be delivered to the central nervous system. If the impulse reaches the nucleus of the raphe Magnus resulting in secreting the enkephalin proceeding in both directions downward to the end of the dorsal nucleus root of the spinal cord (aiming at the secretion of serotonin to affect the spinal cord neurons to secrete enkephalin) in order to inhibit the carrying nerve the pain that enters through the lamina I and IV of the dorsal roots, while the upwardly transmitted signals of the midbrain of the midbrain (periaqueductal), the stimuli received by the periaqueductal are conveyed to the hypothalamus, from this hypothalamus via the descending nerve pathway of the endorphin hormone secreted to the vessels blood, so it can be said that the pain and fatigue is reduced because the release of enkephalin (inside the endorphin beta molecule) released by centring on the brain and spinal cord as a result of the gate control theory also resulted in a sense of euphoria due to the release of the BE hormone that circulates throughout the body (Guyton, 1994). So sports massage is recommended to the athlete in order to increase the levels of the BE hormone that is used in an effort to reduce muscle fatigue and pain, although the rate of increase is not greatly increased compared to IgA.

4 CONCLUSIONS

Sports massage may affect and significantly increase IgA immune and BE hormone levels.

ACKNOWLEDGEMENT

I am grateful to all the sport science students of Yogyakarta State University who have been pleased to be the samples, and the masseurs who generously assisted the treatments.

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