

## Abstrak

*Sport massage* pada perkembangan olahraga di Indonesia maupun dunia internasional sekarang ini, memegang peranan penting dalam mendukung prestasi atlet. *Sport massage* dilakukan oleh para *masseur* atau *masseuse* yang tergabung dalam *sport medicine* bersama medis, fisioterapi dan psikolog. *Sport massage* sendiri paling banyak diminati oleh atlet wanita maupun laki-laki sebagai salah satu perawatan tubuh akibat ketegangan otot atau kontraksi otot yang berlebihan setelah melakukan latihan, saat bertanding atau setelah bertanding supaya kembali relaksasi dan mengurangi asam laktat dalam darah yang berlebihan.

Asam laktat dalam darah pada tubuh atlet akan meningkat pada saat berlatih atau bertanding disebabkan karena saat berlatih dan bertanding mengeluarkan energi dari tubuh. Kebutuhan energi tersebut dapat diperoleh melalui glikolisis. Berdasarkan ketersediaan oksigen dalam sel, glikolisis dapat terjadi secara aerob dan anaerob. Pada glikolisis anaerob terjadi dalam dua jalan yaitu : secara anaerob alaktasit (sistem fosfagen) yang tidak menghasilkan asam laktat dan anaerob laktasit (sistem asam laktat) yang memproduksi asam laktat pada tubuh. Saat anaerob alaktasit terjadi secara terus menerus maka ketegangan otot akan atau kontraksi semakin tinggi. Sehingga penanganan asam laktat dalam darah yang terjadi pada atlet secara berlebihan yang akan menimbulkan cedera pada otot harus segera diperhatikan, sebagai salah satu unsur penunjang peningkatan prestasi.

Penulis akan menguraikan tentang *Sport massage* yang bermanfaat untuk membantu penurunan asam laktat dan proses terbentuknya asam laktat dalam darah

## **MANFAAT *SPORT MASSAGE* PADA ASAM LAKTAT TUBUH**

### **BAB I Latar Belakang**

Di era perkembangan olahraga yang sangat membudaya baik di Indonesia maupun dunia Internasional dari mulai wanita maupun laki-laki, anak-anak, dewasa maupun tua, bahwa dengan berolahraga dapat meningkatkan prestasi, kesehatan dan kebugaran tubuh. Sehingga olahraga sebagai kebutuhan yang tdk dapat dipisahkan dalam kehidupan ini. Salah satunya pada olahraga prestasi, para atlet akan diberikan latihan-latihan yang dapat meningkatkan prestasinya, antara lain: latihan kondisi fisik yang dapat selalu bermanfaat menjaga kebugaran pada otot. Seperti yang diungkapkan oleh Bompa (1999) dan Sharkey (2002: 166) bahwa olahragawan/atlet setiap harinya harus selalu dituntut untuk mempunyai kondisi fisik yang prima diantaranya: menjaga kebugaran pada otot yang digunakan untuk kekuatan, kecepatan, kelincahan, koordinasi, daya ledak, kelentukan, keseimbangan, ketepatan, daya tahan dan reaksi. Sedangkan menurut Rahim (1988:30), bahwa perawatan tubuh sangat penting bagi olahragawan untuk meningkatkan penampilan dan menjaga kondisi fisik supaya tetap bugar dan sehat. Salah satu perawatan yang sering dilakukan oleh atlet adalah dengan *sport massage* yang bertujuan untuk mengurangi ketegangan otot akibat aktivitas latihan ataupun bertanding. Ketegangan otot yang terjadi dipengaruhi oleh asam laktat dalam darah akibat proses tubuh mengeluarkan energi.

Asam laktat dalam darah pada tubuh atlet akan meningkat pada saat berlatih atau bertanding disebabkan karena saat berlatih dan bertanding mengeluarkan energi dari tubuh. Kebutuhan energi tersebut dapat diperoleh

melalui glikolisis. Berdasarkan ketersediaan oksigen dalam sel, glikolisis dapat terjadi secara aerob dan anaerob. Pada glikolisis anaerob terjadi dalam dua jalan yaitu : secara anaerob alaktasit (sistem fosfagen) yang tidak menghasilkan asam laktat dan anaerob laktasit (sistem asam laktat) yang memproduksi asam laktat pada tubuh (Astrand, 2003; Guyton, 2000; Mayes, 2003). Saat anaerob alaktasit terjadi terjadi secara terus menerus maka ketegangan otot akan atau kontraksi semakin tinggi. Sehingga penganan asam laktat dalam darah yang terjadi pada atlet secara berlebihan akan menimbulkan cedera pada otot dan mengakibatkan peningkatan prestasi kurang maksimal.

## **BAB II PEMBAHASAN**

### **Sejarah masase**

Masase merupakan salah satu manipulasi sederhana yang pertama kali dilakukan manusia untuk mengusap bagian tubuh yang sakit, meletakkan tangan dengan halus pada bagian tubuh yang sakit atau mengusap dahi yang panas, dan ternyata menimbulkan efek yang menyenangkan. Praktek masase pertama kali berkembang di Cina, Mesir, dan India. Di negara-negara tersebut masase digunakan sebagai salah satu cara pemeliharaan kesehatan dan pengobatan. Istilah *massage* berasal dari bahasa Arab, yaitu dari kata *mass* atau *mash* yang berarti menekan perlahan-lahan. Sedangkan dalam bahasa Yahudi istilah *massage* adalah *maschesch* yang berarti meraba. Sedangkan dalam bahasa Indonesia, istilah *massage* biasa diterjemahkan dengan pijat atau urut (Rachim, 1988; Salvano, 1999).

Praktek masase yang diterapkan di bidang olahraga, pertama kali dilakukan di Yunani. Saat itu masase digunakan sebagai metode yang penting dalam pemeliharaan olahragawan. Di Cina tercatat bahwa masase telah berkembang sejak 3000 tahun SM. Penganut kepercayaan saat itu mempercayai bahwa masase dapat meningkatkan sirkulasi darah, memperbaiki kondisi hormonal, sebagai penenang atau perangsang saraf, dan sebagai pengobatan bermacam-macam penyakit. Masase adalah manipulasi fisik yang terdiri dari gerakan mengosok tubuh (*effleurage*), perasan (*petrissage*), gerusan (*friction*) pada jaringan lunak diseluruh tubuh, yang dilakukan pada bagian muka, tubuh, anggota tubuh bagian atas dan

bawah (Goats, 1994; Rachim, 1988; Salvano, 1999). Di negara-negara Eropa, Perancis, Swedia, Inggris, Belanda, Jerman, dan Uni Soviet, masase digunakan oleh masyarakat sebagai wahana untuk pemeliharaan orang sakit, cedera dan olahragawan terutama untuk mengembalikan kebugaran dan menghilangkan kelelahan akibat latihan fisik yang berat. Seorang dokter Swedia, Gustaf Zander menciptakan suatu seri masase, yang kemudian dikenal sebagai *Swedish massage*, yang sampai sekarang terus berkembang dan banyak dipakai di seluruh dunia (Rachim, 1988; Salvano, 1999). Telah tercatat dalam sejarah kedokteran moderen, Hipocrates menyatakan bahwa masase dapat menambah kekuatan persendian, dan dapat melemaskan persedian yang kaku. Dokter-dokter Yunani pada masa itu mempraktekkan masase untuk persiapan fisik olahragawan serta untuk melawan kelelahan setelah melakukan latihan fisik yang berat. Celcius seorang dokter ternama pada masa itu juga menganjurkan manipulasi gerusan (friksi) untuk menenangkan. Hasil analisis yang dilakukan Celcius menunjukkan bahwa; gerakan *effleurage*, *petrissage*, dan friksi pada bagian tubuh, dengan mempertimbangkan intensitas gerakan dan lamanya masase berhubungan dengan kapasitas olahragawan terutama organ pernafasan. Sehingga dianjurkan penggunaan masase pada olahragawan (*sport massage*) sebelum latihan, saat berlatih dan sesudah latihan olahraga yang berat (Johnson, 1995; Rachim, 1988; Salvano, 1999). Akhir akhir ini masase yang berkembang diseluruh dunia dan dipakai oleh kalangan olahragawan adalah *sport massage*.

### ***Sport Massage***

*Sport massage* adalah teknik masase yang sering dipakai oleh atlet sebelum, selama, dan sesudah pertandingan atau latihan. Setelah melaksanakan latihan atau setelah pertandingan atlet sangat merasakan

manfaat masase ini untuk mengatasi kelelahan dan mengembalikan kebugaran ( Johnson, 1995; Salvano, 1999).

Teknik dasar *sport massage* terdiri dari :

1) *Effleurage* (menggosok)

Adalah gerakan urut mengusap secara ritmis atau berirama dan berturut-turut dari arah bawah ke atas. *Effleurage* dilakukan dengan telapak tangan dan jari rapat. Pada saat tangan bergerak meluncur di atas permukaan tubuh, tangan harus mengikuti kontur tubuh, gerakan ini harus mengalir tanpa terputus. Gerakan *effleurage* dilakukan dengan tekanan ringan, dan dapat dilakukan tekanan yang lebih kuat saat mengarah ke jantung. Saat tangan kembali ke posisi awal, gerakan harus dilakukan dengan usapan yang lebih ringan dan menenangkan. Tujuan dari *effleurage* adalah meratakan minyak pada permukaan yang tubuh, membantu memperlancar aliran darah dan meningkatkan suhu kulit. Gerakan *effleurage* biasanya dilakukan untuk mengawali dan mengakhiri masase, serta sebagai gerakan transisi antara gerakan yang satu ke gerakan berikutnya.

2) *Petrissage* (memijat-mijat)

Adalah gerakan memijat masa otot yang dilakukan dengan satu tangan atau kedua tangan. *Petrissage* dapat melemaskan kekakuan di dalam jaringan. Pelaksanaan *petrissage* untuk tempat-tempat yang lebar dapat dilakukan dengan kedua tangan memijat bersama-sama atau kedua tangan bergantian secara berurutan. Untuk daerah yang sempit cukup memijat dengan ujung-ujung jari, arah gerakannya naik turun bebas. Tujuan dari *petrissage* adalah memperlancar penyaluran zat-zat di dalam jaringan ke dalam pembuluh-pembuluh darah dan getah bening, seakan-akan diremas dan didorong ke dalam sistem pembuluh tersebut. Sehingga dengan *petrissage* memberikan keuntungan berupa peningkatan aliran darah, membantu membuang produk hasil metabolik, meredakan pembengkakan lokal, dan meningkatkan nutrisi seluler. Disamping itu *petrissage* memberikan efek

mekanis sehingga menyebabkan relaksasi otot serta merangsang sistem saraf ( Goats 1994; Rachim A. 1988; Salvano, 1999).

### 3) Vibrasi

Vibrasi adalah gerakan menggetarkan masa otot secara berirama dengan tekanan ringan. Gerakan ini dilakukan dengan cara membengkokkan siku jari-jari yang ditekankan pada tempat yang dikehendaki, kemudian kejangaan seluruh lengan tersebut dan getarkan masa otot secara ritmis. Vibrasi dapat memberikan rangsangan pada ujung-ujung saraf.

### 4) *Tapotement* (Memukul-mukul)

*Tapotement* adalah gerakan memukul masa otot yang dapat mempengaruhi tonus syaraf otonom jaringan perifer sehingga mengalami relaksasi. Pada umumnya *tapotement* dilakukan dengan kedua tangan bergantian. Sikap tangan dapat berupa setengah mengepal, jari-jari terbuka atau rapat, dapat pula dengan punggung jari-jari atau dengan mencekungkan telapak tangan dengan jari-jari merapat. Biasanya *tapotement* diberikan di daerah pinggang, punggung atau daerah otot-otot tebal dengan arah gerakan naik turun bebas. Tujuannya mengurangi tonus otot dan memperlancar peredaran darah.

### 5) Friksi (Menggerus)

Friksi adalah menghancurkan bekuan dan pengerasan di dalam jaringan ikat dan otot. Friksi dapat dikerjakan dengan ujung-ujung jari, atau pangkal telapak tangan, disesuaikan dengan keadaan. Caranya dengan menekankan ujung-ujung jari tersebut dan putar-putarkan berurutan sambil berpindah tempat atau menetap. Tujuannya yaitu memperlancar aliran darah sehingga sirkulasi darah kembali normal dan meningkatkan pertukaran zat di dalam masa otot. Pada kondisi tertentu masase tidak diperkenankan. Kondisi yang menjadi kontraindikasi masase adalah luka terbuka, fraktur tulang/ sendi, pembengkakkan, peradangan akut pada lokasi yang akan dimasase (Goats, 1994; Salvano, 1999).

## **Asam Laktat**

Sebagai makhluk hidup tubuh selalu memerlukan energi untuk menjalankan aktivitasnya. Kebutuhan energi tersebut dapat diperoleh melalui glikolisis. Berdasarkan ketersediaan oksigen dalam sel, glikolisis dapat terjadi secara aerob dan anaerob. Pada glikolisis anaerob terjadi dalam dua jalan yaitu : secara anaerob alaktasit (sistem fosfagen) yang tidak menghasilkan asam laktat dan anaerob laktasit (sistem asam laktat) yang memproduksi asam laktat (Astrand, 2003; Guyton, 2000; Mayes, 2003).

Pada sistem aerobik, energi dalam bentuk ATP dihasilkan dari oksidasi piruvat dalam mitokondria dengan hasil akhir CO<sub>2</sub> dan H<sub>2</sub>O. Dan pada sistem anaerob alaktasit (sistem fosfagen = sistem ATP-PC) energi dihasilkan dari pemecahan ATP dan kreatinin fosfat. Secara sederhana rangkaian reaksi pembentukan energi melalui sistem ATP-PC dapat dituliskan sebagai berikut :

1)  $ATP \rightarrow ADP + P_i + \text{energi}$

ATP yang tersedia dapat digunakan untuk aktivitas fisik selama 1-2 detik

2)  $PC (\text{phosphocreatin}) + ADP \rightarrow \text{kreatin} + ATP$

ATP yang terbentuk dapat digunakan untuk aktivitas fisik selama 6-8 detik.

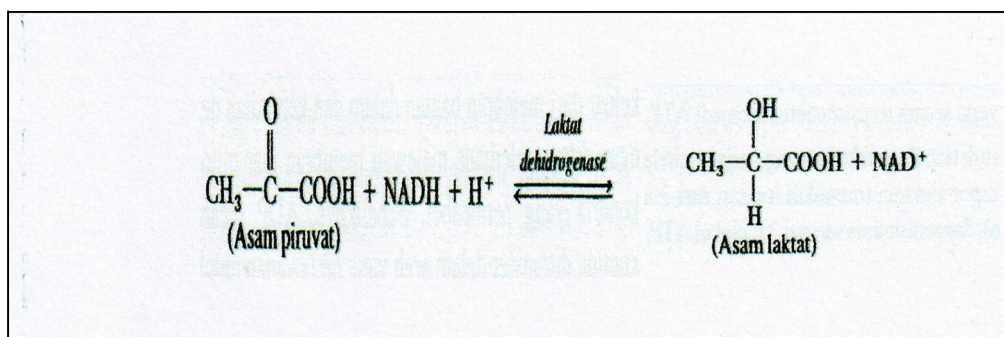
Sedangkan sistem anaerob laktasit adalah metabolisme glukosa dengan hasil akhir ATP dan asam laktat, yang rangkaian reaksinya secara sederhana dapat dituliskan sebagai berikut :

$\text{Glikogen/glukosa} + ADP + P_i \rightarrow ATP + \text{asam laktat}$

ATP yang dihasilkan pada sistem anaerob laktasit ini dapat digunakan untuk aktivitas fisik selama 45-120 detik. Pembentukan ATP dengan sistem anaerob laktasit ini menghasilkan asam laktat, yang merupakan hasil metabolisme antara, yang apabila produksinya melebihi kecepatan eliminasinya dapat mempengaruhi kinerja otot. Namun demikian tubuh memiliki kemampuan untuk menetralkan produksi asam laktat yang tinggi dengan jalan resintesa sebanyak 98 % dan ekskresi melalui urin dan keringat



sebesar 2%. Resintesa asam laktat menghasilkan tiga zat : pertama adalah energi dari piruvat yang merupakan 72 % dari seluruh asam laktat yang dihasilkan melalui oksidasi aerob. Kedua, 18 % asam laktat akan dikonversi menjadi glikogen di hati melalui siklus Cori. Ketiga, asam laktat sebesar 8 % akan mengalami resintesa menjadi asam amino alanin. Ini berarti apabila terdapat peningkatan masuknya asam laktat ke dalam sirkulasi darah yang melebihi laju eliminasi asam laktat akan menyebabkan jumlahnya dalam sirkulasi darah meningkat . (Fox, 1988; Stainby, 1986; Brooks, 1986; Farrel, dkk. 1991). Dalam keadaan istirahat asam laktat tetap diproduksi. Dan asam laktat dalam keadaan istirahat dihasilkan oleh sel darah merah, sel darah putih, otak, sel otot, sel hati, mukosa usus dan kulit (Brooks & Fahey, 1985; Katz, 1988). Kadar asam laktat dalam darah vena dalam keadaan istirahat adalah 0.63 –2.44 mmol/l, sedangkan sumber asam laktat yang terbesar pada keadaan istirahat berasal dari pemecahan glukosa di dalam sel darah merah (Fox, 1988; Stainby, 1986; Brooks, 1986; Farrel, dkk. 1991). Dalam keadaan kekurangan oksigen piruvat akan diubah menjadi asam laktat dengan bantuan enzim laktat dehidrogenase (LDH). Terdapat dua tipe enzim LDH yaitu : LDH tipe M dan tipe H. Kedua tipe LDH ini memiliki kemampuan yang berbeda dalam konversi piruvat – asam laktat. LDH tipe M memiliki afinitas yang lemah terhadap piruvat dibanding tipe H , sehingga condong mengubah piruvat menjadi asam laktat. Laktat dehidrogenase tipe H banyak terdapat pada otot jantung, sedangkan LDH tipe M banyak terdapat pada serabut otot rangka tipe II (Brooks & Fahey, 1985; Guyton 2000). Konversi asam piruvat - asam laktat dengan bantuan enzim laktat dehidrogenase sebagai mana digambarkan pada gambar 1.



Gambar 1. Perubahan asam piruvat menjadi asam laktat (Guyton, 2000)

Asam laktat yang terbentuk dalam sel otot akan berdifusi ke luar sel, kemudian asam laktat ekstraseluler ini akan masuk ke dalam sel apabila akan digunakan sebagai sumber energi atau sebagai bahan glukoneogenesis. Untuk masuk ke dalam sel asam laktat melalui dua cara, yakni difusi sederhana dan difusi dipermudah. Hanya sebagian kecil asam laktat yang masuk ke dalam sel dengan cara difusi sederhana melalui membran sel. Sedangkan sebagian besar asam laktat masuk ke dalam sel dengan jalan difusi dipermudah melalui konjugasi dengan kation  $H^+$ ,  $Na^+$ , dan  $K^+$ . Gradien pH otot dan darah mempengaruhi arah transportasi asam laktat. Apabila pH sel otot lebih rendah dibandingkan dengan pH darah, maka asam laktat akan ke luar dari sel-sel otot yang aktif dan akan masuk ke dalam sel oksidatif dan sel inaktif yang berdekatan. Namun apabila pH darah lebih rendah dibanding dengan sel otot, maka asam laktat dalam darah akan masuk ke hati, jantung, ginjal, dan otot yang tidak aktif ( Stansby & Brooks, 1990). Dalam keadaan istirahat otot rangka secara bersamaan membentuk dan mengkonsumsi asam laktat. Pada saat otot berkontraksi terjadi peningkatan pembentukan dan konsumsi asam laktat lebih banyak. Menurut Hultman dan Sahlin yang dikutip oleh Budiman (1996), bila konsentrasi asam laktat dalam darah meningkat, maka otot-otot yang istirahat akan mengkonsumsi asam laktat sebagai sumber energi dengan jalan oksidasi hingga mencapai 50 %. Sedangkan otot yang aktif merupakan jaringan yang dapat mengeliminasi asam laktat dalam jumlah terbesar dengan cara oksidasi hingga mencapai 90 %. Kemampuan otot dalam metabolisme asam laktat ini disebabkan, serabut otot rangka terdiri dari serabut tipe lambat (tipe I) merupakan serabut tipe aerobik (serabut otot merah) serta tipe cepat (tipe II) merupakan serabut tipe

anareobik (serabut otot putih). Serabut tipe I lebih banyak mengandung myoglobin, mitokondria dan enzim oksidatif dibandingkan dengan serabut tipe II sehingga memiliki kapasitas oksidatif. Sedangkan serabut tipe II (serabut otot putih) mengandung lebih banyak kreatin fosfat, glikogen, myosin ATP-ase, dan enzim glikolitik dibandingkan dengan serabut tipe I, sehingga memiliki kapasitas glikolitik. Pada aktivitas intensitas rendah serabut tipe I lebih dominan terpakai, sedangkan pada aktivitas intensitas tinggi serabut tipe I dan II terpakai ( Brooks & Fahey, 1985; Astrand & Rodhal, 2003). Sehingga pada aktivitas intensitas rendah eliminasi asam laktat terjadi lebih cepat. Beberapa peneliti melaporkan bahwa asam laktat dapat dioksidasi oleh sel-sel otot atau ditransport ke sel lainnya melalui difusi yang dipermudah oleh *monocarboxylate transporter* (MCT) (Brooks, 1986; Philp, A., 2005; Tonouchi, dkk., 2002).

### **Pengaruh *Sport Massage* terhadap Kadar Asam Laktat Darah**

*Sport massage* yang dilakukan pada tubuh memberikan efek fisiologis berupa: peningkatan aliran darah, aliran limfatik, stimulasi sistem saraf, meningkatkan aliran balik vena. Keuntungan lain adalah menghilangkan rasa sakit dengan cara meningkatkan ambang rasa sakit, oleh karena merangsang peningkatan produksi hormon endorfin. Demikian pula *sport massage* dapat mencegah terjadinya trauma, memberikan efek rehabilitasi dan relaksasi. Penelitian yang dilakukan oleh Dubrovsky (1990) menunjukkan bahwa masase secara langsung dapat meningkatkan aliran vena di kulit serta meningkatkan aliran balik vena. Meningkatnya aliran balik vena ini akan membantu secara efisien pengembalian darah ke jantung, serta membantu mengalirkan asam laktat yang tertimbun dalam otot sehingga membantu mempercepat eliminasi asam laktat dalam darah dan otot (Cafarelli & Flint, 1992; Corrigan, 1997 )

Beberapa peneliti mengemukakan bahwa *sport massage* superfisial yang dilakukan dengan baik pada otot yang telah bekerja maksimal atau pada seluruh tubuh memberikan efek pada penurunan kadar asam laktat darah (Dodd, dkk.,1993; Lee dan Kim, 1998). Penurunan kadar asam laktat ini disebabkan meningkatnya aliran darah dengan cepat yang dapat memfasilitasi pengaliran asam laktat lebih cepat untuk digunakan sebagai sumber energi di bagian organ lain. Hasil penelitian Cafarelli menyimpulkan bahwa masase yang dilakukan dengan teknik yang tepat dapat meningkatkan aliran darah perifer sebesar 50 %, meningkatkan jumlah sel eritosit 7%, sehingga kinerja dan waktu pemulihan dapat terjadi lebih baik (Cafarelli dan Flint, 1992). Hal ini didukung oleh penelitian yang dilakukan oleh Goats (1994) membuktikan bahwa, gerakan *tapotement* pada masase dapat meningkatkan aliran darah pada otot- otot besar. Bahkan *effleurage* terbukti lebih efektif dalam menurunkan deposit asam laktat dalam sel-sel otot bila dibandingkan dengan olahraga intensitas sedang. Demikian pula dengan masase terjadi peningkatan eliminasi produk hasil metabolisme seperti natrium dan kalium yang dipandang turut berperan dalam menimbulkan kelelahan ( Arkko, 1983; Dolgener dan Morien, 1993). Masase juga dapat meningkatnya aliran balik vena sehingga akan meningkatkan oksigenasi jaringan otot, mempercepat eliminasi asam laktat (Caffareli & Flint, 1992). Meningkatnya oksigenasi jaringan akan meningkatkan konversi asam laktat menjadi piruvat sehingga mempercepat penyediaan energi kembali dan mempercepat pemulihan (Astrand, 2003; Foss & Keteyian, 1998). Namun demikian menurut Laughling yang dikutip oleh Corrigan (1997), masase tidak secara langsung meningkatkan aliran dalam arteri. Peningkatan yang terjadi dalam arteri sangat tergantung pada peningkatan yang terjadi dalam arteriol dan tekanan vena yang cenderung dipengaruhi oleh aliran darah sepanjang kapiler.

Hasil penelitian dilakukan oleh Arkko, dkk. (1983) yang dikutip oleh Corrigan (1997), menyebutkan bahwa masase juga dapat meningkatkan konsentrasi : kreatin kinase, laktat dehydrogenase dalam sel otot. Demikian pula masase dapat merangsang aliran lymphe, hal ini dibuktikan oleh Cafarelli dan Flint (1992) dalam penelitiannya, bahwa masase dapat meningkatkan diameter pembuluh lymphe sebesar 25 %. Hasil penelitian ini menunjukkan keuntungan masase selama pemulihan dapat meningkatkan aliran balik vena sehingga membantu mempercepat eliminasi asam laktat. Penelitian yang dilakukan oleh Bahartresna (2005) pada individu tidak terlatih menyimpulkan bahwa *sport massage* selama masa pemulihan menurunkan kadar asam laktat darah lebih baik dibandingkan dengan istirahat pasif setelah aktivitas lari 200 meter. Demikian pula penelitian yang dilakuka oleh Jones dan Mondero membuktikan bahwa *sport massage* dapat meningkatkan eliminasi asam laktat selama masa pemulihan setelah latihan intensitas tinggi. Demikian pula hasil penelitian Martin, dkk. *sport massage* selama 20 menit menyebabkan penurunan asam laktat darah sebesar 36, 21 %, serta menurut David, dkk. *Sport massage* selama 45 menit menyebabkan penurunan asam laktat darah sebesar 72,4 % (David, dkk, 2005; Martin, dkk., 1998).

# BENEFITS OF SPORT MASSAGE TO LACTIC ACID OF THE BODY

## Abstract

Sports massage on the development of sport in Indonesia and the international community today, plays an important role in supporting the achievements of athletes. Sports massage performed by the Masseur or masseuse who joined in sports medicine with the medical, physiotherapy and a psychologist. Sports massage themselves most attractive to female athletes as well as men as a body treatment by muscle tension or excessive contraction of muscles after exercise, while playing or after playing back to relaxation and reducing blood lactic acid in excess. Lactic acid in the blood of athletes will increase the body during practice or play because of the practice and compete from the body expends energy. Energy requirements can be obtained through glycolysis. Based on the availability of oxygen in the cell, glycolysis can occur in aerobic and anaerobic. In anaerobic glycolysis occur in two ways, namely: the anaerobic alaktasit (fosfagen systems) that do not produce lactic acid and anaerobic laktasit (lactic acid system) that produce lactic acid in the body. When anaerobic alaktasit occurred continuously the muscle tension or contraction will be higher. So snacks in the blood lactic acid that occurs in athletes who excessively will cause injury to the muscles must be considered, as one element supporting performance improvement. The author will describe the Sport massage is useful to help decrease lactic acid and lactic acid formation processes in the blood

## CHAPTER Background

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so that non-separable in this life. One of these achievements in sports, the athletes will be given exercises that can improve achievement, including: exercise physical condition that can always be useful in maintaining muscle fitness. As expressed by Bompa (1999) and Sharkey (2002: 166) that the sportsmen / athletes every day should always be required to have excellent physical condition include: maintaining fitness in the muscles used for strength, speed, agility, coordination, explosive power, flexibility, balance, accuracy, endurance and reaction. Meanwhile, according to Rahim (1988:30), that body care is very important for athletes to improve performance and maintain the physical condition in order to remain fit and healthy. One treatment is often performed by athletes is a sports massage that aims to reduce muscle tension due to exercise or play activities. Muscle tension that occurs is influenced by lactic acid in the blood because the body expends energy process. Lactic acid in the blood of athletes will increase the body during practice or play because of the practice and compete from the body expends energy. Energy requirements can be obtained through glycolysis. Based on the availability of oxygen in the cell, glycolysis can occur in aerobic and anaerobic. In anaerobic glycolysis occur in two ways, namely: the anaerobic alaktasit (fosfagen systems) that do not produce lactic acid and anaerobic laktasit (lactic acid system) that produce lactic acid in the body (Astrand, 2003; Guyton, 2000; Mayes, 2003). When anaerobic alaktasit occurred continuously the muscle tension or contraction will be higher. So snacks in the blood lactic acid that occurs in athletes in excess will cause injury to muscles and result in less maximum performance improvement.

## CHAPTER DISCUSSION

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### Massage

### History

Massage is one of the simple manipulation of the first human made to wipe the body sick, laid his hand gently on the body is ill, or rubbed his forehead hot, and it was a nice effect. The practice of massage was first developed in China, Egypt, and India. In these countries used massage as one way of health maintenance and treatment. Massage term comes from Arabic, that is from the mass or mash, which means pressing it slowly. While in the Semitic languages the term massage is a means maschesch felt. Meanwhile in the Indonesian language, the term usually translated massage with a massage or massage (Rachim, 1988; Salvano, 1999). The practice of massage is applied in the field of sports, do petama time in Greece. When it is used as a method of massage is important in the maintenance of sports. Noted that in China massage was developed since 3000 years BC. Moment faiths believe that massage can increase blood circulation, improve hormonal conditions, as a sedative or stimulating nerves, and for the treatment of various diseases. Massage is the physical manipulation of body brushing movements (effleurage), lemon (petrissage), gerusan (friction) to the soft tissues throughout the body, which is on the face, body, upper limbs and lower (Goats, 1994; Rachim, 1988; Salvano, 1999). In European countries, France, Sweden, England, Holland, Germany, and the Soviet Union, massage is used by the community as a vehicle for the maintenance of the sick, injured and athletes in particular to restore health and eliminate fatigue from heavy physical exercise. A Swedish doctor, Gustav Zander create a series of massage, which became known as the Swedish massage, which until now continue to grow and is widely used around the world (Rachim, 1988; Salvano, 1999). Have been recorded in the history of modern medicine, stated that Hipocrates massage can increase joint strength, and can loosen a stiff supply. Greek doctors of the time practicing massage for athletes and physical preparation to fight fatigue after strenuous exercise. Celsius



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**Sport Massage**  
 Sport massage is a massage technique that is often used by athletes before, during, and after the game or practice. After the exercise, or after the game greatly benefit athletes of this massage to overcome fatigue and restore fitness (Johnson, 1995; Salvano, 1999).

**Basic techniques of sports massage:**  
 1) **Effleurage (rubbing)**

Sequential movements are rhythmically rubbing or rhythmic and berturuturut from the bottom up. Effleurage done with your palms and fingers pressed together. At the time of moving the hands glide over the surface of the body, the hands should follow the contours of the body, this movement must flow without interruption. Effleurage movements done with light pressure, and can be a stronger pressure towards the heart. When the hands return to the starting position, movement should be done with greater stroke

light and soothing. The purpose of effleurage is to flatten the surface of oil on the body, helps facilitate blood flow and skin temperature increases. Effleurage movements are usually done to initiate and end the massage, as well as the movement of transition between one movement into the next movement.

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3) **Vibration**

Customization is the movement of muscles vibrate in rhythm with light pressure. This movement is done by bending your elbows pressed against jarijari the desired place, then the kejangkaan whole arm and the muscle getarkan rhythmically. Vibration can provide stimulus to the nerve endings.

4) Tapotement (Hit hit)

Tapotement is hitting the muscle movements that can affect the autonomic nervous tone of peripheral tissue that has relaxation. Tapotement generally done with both hands alternately. This attitude can be half the hands clenched, the fingers open or meeting, can also with the back fingers or with mencekungkan palms with fingers pressed together. Tapotement usually given in the waist, back or muscle area thick with the direction of movement up and down free. Aim to reduce smooth muscle tone and circulation.

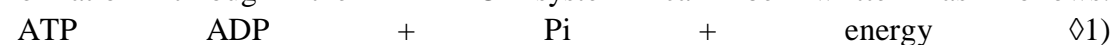
5) friction (grinding)

Friction is to destroy clots and hardening of the connective tissue and muscle. Friction can be done with the fingertips or the heel of her hand, adapted to the circumstances. Way by emphasizing fingertips and swivel-Play sequence while the move or stay. The aim is to smooth the flow of blood that returns to normal blood circulation and promote the exchange of substances in the muscle. In certain conditions massage is not allowed. Conditions which massage is contraindicated open wounds, bone fractures / joints, swelling, acute inflammation at the site will dimasase (Goats, 1994; Salvano, 1999).

Lactic acid

As the body of living things always need energy to run akivitasnya. Energy requirements can be obtained through glycolysis. Based on the availability of oxygen in the cell, glycolysis can occur in aerobic and anaerobic. In anaerobic glycolysis occur in two ways, namely: the anaerobic alaktasit (fosfagen systems) that do not produce lactic acid and anaerobic laktasit (lactic acid system) that produce lactic acid (Astrand, 2003; Guyton, 2000; Mayes, 2003).

In aerobic systems, the energy in the form of ATP generated from oxidation of pyruvate in the mitochondria with the end result of CO<sub>2</sub> and H<sub>2</sub>O. And on alaktasit anaerobic system (system fosfagen = ATP-PC system) solution to the energy generated from ATP and creatinine phosphate. In a simple chain reaction of energy formation through the ATP-PC system can be written as follows:

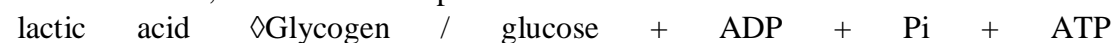


ATP is available can be used for physical activity for 1-2 seconds



PC (phosphocreatin) ATP is formed can be used for physical activity for 6-8 seconds.

While the system is laktasit anaerobic metabolism of glucose by the end of the ATP and lactic acid, which is a simple series of reactions can be written as follows:



ATP produced in this laktasit anaerobic system can be used for physical activity for 45-120 seconds. The formation of ATP by anaerobic system produces laktasit lactic acid, which is the result of matabolisme, which, if production exceeds elimination rate can affect muscle performance. However, the body has the ability to neutralize lactic acid production higher by as much as 98% resintesa and excretion through urine and sweat for 2%. Lactic acid produced Resintesa three substances: first is the

energy of the pyruvate which is 72% of the lactic acid produced through aerobic oxidation. Second, 18% lactic acid will be converted into glycogen in the liver through the Cori cycle. Third, lactic acid of 8% will experience resintesa to the amino acid alanine. This means that if there is increased entry of lactic acid in the blood circulation in excess of the rate of elimination of lactic acid will cause the amount in the blood circulation increases. (Fox, 1988; Stainby, 1986; Brooks, 1986; Farrel, et al. 1991). In the resting state remains lactic acid produced. And lactic acid in a state of rest produced by red blood cells, white blood cells, brain, muscle cells, liver cells, intestinal mucosa and skin (Brooks & Fahey, 1985; Katz, 1988). Lactic acid levels in venous blood during rest was 0.63 -2.44 mmol / l, while the source of the greatest lactic acid in the resting state comes from the breakdown of glucose in the red blood cells (Fox, 1988; Stainby, 1986; Brooks, 1986; Farrel, et al. 1991). In a lack of oxygen pyruvate is converted into lactic acid with the help of the enzyme lactate dehydrogenase (LDH). There are two types of enzymes LDH: LDH type M and Type H. Both types of LDH have different abilities in the conversion of pyruvate - lactic acid. LDH type M has a weak affinity for pyruvate than the type H, so that tends to change pyruvate into lactic acid. Lactate dehydrogenase H there are many types of heart muscle, while LDH type M are scattered in the skeletal muscle fiber type II (Brooks & Fahey, 1985; Guyton 2000). Conversion of pyruvic acid - lactic acid with the help of the enzyme lactate dehydrogenase which is described in Figure 1.

Figure 1. Changes of pyruvic acid into lactic acid (Guyton, 2000) Lactic acid formed in muscle cells will diffuse out of cells, and this extracellular lactic acid will enter the cell where you want to use as an energy source or as gluconeogenesis. To enter into the cells of lactic acid in two ways, namely a simple diffusion and facilitated diffusion. Only a small portion of lactic acid into the cell by simple diffusion through the cell membrane. While most of the lactic acid into the cell by facilitated diffusion through conjugation with the cation  $H^+$ ,  $Na^+$ , and  $K^+$ . PH gradient affects the muscles and blood lactic acid transport direction. If the pH of the muscle cells was lower than blood pH, the lactic acid will be out of the muscle cells are active and will enter into oxidative cell and the adjacent inactive cells. However, if the lower blood pH compared with muscle cells, the lactic acid in the blood going into the liver, heart, kidneys, and muscles that are inactive (Stansby & Brooks, 1990). In the resting state of skeletal muscle at the same time to form and consume lactic acid. At the time of contracting muscle increases the formation and consumption of more lactic acid. According to Hultman and Sahlin, quoted by Budiman (1996), when Lakat acid concentration in the blood increases, the muscles

that break will consume the lactic acid as an energy source by means of oxidation up to 50%. While the active muscles is a network that can eliminate lactic acid in the largest amount of oxidation by up to 90%. The ability of muscle in the metabolism of lactic acid is due, skeletal muscle fibers composed of slow type fibers (type I) is a type of aerobic fibers (red muscle fibers) and fast type (type II) is a type anaerobic fibers (white muscle fibers). Type I fibers contain more myoglobin, mitochondria and oxidative enzymes than type II fibers so that the oxidative capacity. Whereas type II fibers (white muscle fibers) contains more creatine phosphate, glycogen, myosin ATP-ase, and glycolytic enzymes than type I fibers, which have glycolytic capacity. In low-intensity activity with type I fibers are more dominant in use, whereas the high-intensity activity fibers type I and II, unused (Brooks & Fahey, 1985; Astrand & Rodhal, 2003). Thus the low-intensity activity of lactic acid elimination occurs more rapidly. Some researchers reported that lactic acid can be oxidized by muscle cells or transported to other cells via facilitated diffusion by monocarboxylate transporter (MCT) (Brooks, 1986; Philp, A., 2005; Tonouchi, et al., 2002).

**Sport Massage influence on blood lactic acid levels**  
Sport massage is done on the body's physiological effects include: increased blood flow, lymphatic drainage, stimulating the nervous system, increase the flow through the vein. Another advantage is to relieve pain by increasing the pain threshold, because the hormones stimulate production of endorphins. Similarly, sports massage can prevent injury, providing rehabilitation and relaxation effects. Research conducted by Dubrovsky (1990) shows that massage can directly increase the venous flow in the skin and vein meningkakan backflow. The increased flow through this vein will help to efficiently return blood to the heart, and help drain the accumulated lactic acid in the muscles that help mepercepat elimination of lactic acid in blood and muscle (Cafarelli & Flint, 1992; Corrigan, 1997) Some researchers argue that sports massage is done with the superficial muscle both have worked the maximum or the entire body to give effect to a decrease in blood lactic acid levels (Dodd, et al., 1993; Lee and Kim, 1998). Decreased levels of lactic acid is caused by increased blood flow that can facilitate rapid drainage of lactic acid more quickly for use as an energy source in the other organs. Cafarelli research results concluded that massage is done with proper technique can improve peripheral blood flow by 50%, increasing the number of cells eritosit 7%, so the performance and recovery time can occur either (Cafarelli and Flint, 1992). This is supported by research conducted by the Goats (1994) proved that, tapotement movement in massage can increase blood flow to large muscles. Effleurage proved even more effective in reducing lactic acid deposits in the muscle cells when compared with moderate intensity exercise. Similarly, the elimination of massage increases metabolism products such as sodium and potassium are considered have a role in causing fatigue (Arkko, 1983; Dolgener and Morien, 1993). Massage can also increase the flow through the veins so that it will increase the oxygenation of muscle tissue, accelerate the elimination of lactic acid (Caffareli & Flint, 1992). Increased

tissue oxygenation will increase the conversion of lactic acid into pyruvic so as to accelerate the provision of energy and speed recovery return (Astrand, 2003; Foss & Keteyian, 1998). However, according Laughling quoted by Corrigan (1997), massage does not directly increase the flow in the arteries. Improvement occurs in the arteries is highly dependent on the increase occurred in the arterioles and venous pressures are likely to be influenced by blood flow through capillaries. Results of research conducted by the Arkko, et al. (1983), quoted by Corrigan (1997), states that massage can also improve concentration: creatine kinase, lactate dehydrogenase in muscle cells. Similarly, massage can stimulate the flow lymph, this is evidenced by Cafarelli and Flint (1992) in his research, that massage can increase lymph vessel diameter by 25%. The results of this study show a profit during the recovery massage can improve the flow through the veins that help accelerate the elimination of lactic acid. Research conducted by Bahartresna (2005) in untrained individuals concluded that sports massage for the lower recovery of blood lactic acid levels better than the passive rest after the 200-meter running events. Similarly dilakuka research by Jones and Mondero prove that sports massage can increase the elimination of lactic acid during recovery after high intensity exercise. Similarly, research Martin, et al. sports massage for 20 minutes caused a decrease in blood lactic acid for 36, 21%, and according to David, et al. Sport massage for 45 minutes caused a decrease in blood lactic acid of 72.4% (David, et al, 2005; Martin, et al., 1998).

BENEFITS OF MASSAGE ON SPORT BODY lactic acid

## CHAPTER I

### Introduction

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Figure

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