

## RINGKASAN

Peningkatan kapasitas latihan seseorang yang berlari rutin berhubungan dengan perbaikan kualitas endotel vaskuler. Upaya meningkatkan kapasitas latihan dapat dilakukan dengan meningkatkan kekuatan dan *endurance* otot respirasi menggunakan *pressure threshold inspiratory muscle training (IMT)*. Penambahan *elastic taping* pada dinding toraks saat latihan memungkinkan otot inspirasi berkontraksi secara optimal sehingga kapasitas latihan lebih meningkat begitupun dengan kualitas endotel vaskuler.

Kualitas endotel vaskuler dilihat dengan mengukur aktivitas trombosit (salah satunya dengan mengukur *mean platelet volume/MPV*), kadar *nitrit oxide* dan prostasiklin, ataupun diameter vaskuler dan aliran darahnya. Peningkatan aktivitas trombosit ditandai dengan perubahan ukuran trombosit menjadi lebih besar (peningkatan MPV). Efek peningkatan kekuatan otot dan *endurance* otot inspirasi setelah latihan dengan *threshold IMT* ditambah *elastic taping* terhadap kapasitas latihan telah banyak dilaporkan, namun informasi tentang efek latihan terhadap aktivitas trombosit belum didapatkan.

Penelitian ini dilakukan selama empat minggu setelah mendapat kelayakan Etik dari Komite Etik RSUD Dr. Soetomo dengan jumlah subyek penelitian 14 pelari rekreasi berusia 20-40 tahun di Surabaya. Subyek dibagi dalam dua kelompok, yaitu kelompok yang mendapat latihan otot inspirasi dengan *pressure threshold IMT* dan *elastic taping* dan latihan otot inspirasi dengan *pressure threshold IMT* saja. Pengukuran MPV dilakukan dengan pemeriksaan darah menggunakan *Hematology Analyzer Sysmex XN 1000 B3/A1* pada minggu pertama sebelum latihan dan setelah empat minggu latihan. Frekuensi latihan nafas dua kali sehari 30 repetisi, lima kali seminggu dengan tahanan 60% dari 30 RM, sedangkan frekuensi berlari tiga kali seminggu di atas *treadmill* dengan kecepatan 4,5 mph inklinasi 0% di Poli Rawat Jalan Instalasi Rehabilitasi Medik RSUD Dr. Soetomo Surabaya.

Hasil penelitian ini menunjukkan tren penurunan MPV pada kelompok *pressure threshold IMT* dan *elastic taping* ( $p=0,88$ , CI 95%), peningkatan MPV

pada kelompok *pressure threshold IMT* ( $p=0,31$ , CI 95%) setelah empat minggu latihan. Pengaruh penambahan *elastic taping* pada latihan otot inspirasi dengan *pressure threshold IMT* sebesar 99% ( $r^2=0,99$ ). Tidak didapatkan perbedaan bermakna MPV antar kedua kelompok uji setelah latihan empat minggu ( $p = 0.33$ , CI 95%). Kami mengambil kesimpulan bahwa latihan otot inspirasi dengan *pressure threshold IMT* dan *elastic taping* menunjukkan tren yang lebih baik dalam menghambat aktivitas trombosit pelari rekreasi.

## SUMMARY

Regular running can increase exercise capacity and quality of vascular endothelium. Breathing exercises using pressure threshold inspiratory muscle training (IMT) can improve exercise capacity which also has the possibility to improve vascular endothelium. The addition of elastic taping to the thoracic wall during exercise allows the inspiratory muscles to contract optimally so that the functional capacity and vascular endothelial quality can increase optimally.

Endothelium quality can be assessed by evaluating the platelet activity, such as by measuring the mean platelet volume (MPV) in response to endothelial damage. In this study we examined whether the addition of elastic taping to pressure threshold IMT can lead to further improvement of the endothelium quality, indicated by the decreasing of the the MPV. The improvement of exercise capacity after breathing exercise using pressure threshold IMT with elastic taping has been widely reported, nevertheless information about the effect of exercise on platelet activity has not been reported.

Our research was conducted after had ethical clearance by Ethics Committee of Dr. Soetomo Hospital. Research subjects were 14 - recreational runners who met the inclusion criteria. Subjects were divided into two groups, pressure threshold IMT with elastic taping and pressure threshold IMT without elastic taping. The breathing exercises were done twice -a day, with 30 repetitions, five times a week with resistance 60% of 30 RM. Running exercises were done three times a week with a treadmill (with the speed of 4.5 mph and 0% inclination) at the Physical Medicine and Rehabilitation Department of Dr. Soetomo Hospital. RM 30 doses were adjusted every week. Platelet activity measurements were carried out in the first week before exercise and after four weeks of exercise using *Hematology Analyzer Sysmex XN 1000 B3/A1* as Mean Platelet Volume (MPV).

Within the same group, there was an inhibition trend of MPV enlargement in the pressure threshold IMT and elastic taping group ( $p = 0.88$ , CI 95%) and an increase of MPV in the pressure threshold IMT alone group after four weeks of exercise. However, there was no significant differences in the change of MPV value between the two groups ( $p = 0.33$ , CI 95%). The influence of elastic taping application is 99% ( $r^2=0,99$ ). We conclude that inspiratory muscle training using pressure threshold IMT and elastic taping showed a better trend in delayed recreational platelet runner activity.

## ABSTRAK

### **Efek Penambahan *Elastic Taping* Pada Latihan Otot Inspirasi Dengan *Pressure Threshold IMT* Terhadap Aktivitas Trombosit Pelari Rekreasional Di Surabaya**

Asriningrum, Damayanti Tinduh, S.M Mei Wulan

**Latar belakang:** Peningkatan kapasitas latihan seseorang yang berlari rutin berhubungan dengan perbaikan kualitas endotel vaskuler. Latihan otot inspirasi menggunakan *pressure threshold IMT* dapat memperbaiki kapasitas latihan seseorang sehingga potensial meningkatkan kualitas endotel vaskuler. Penambahan *elastic taping* pada dinding thorax saat latihan memungkinkan otot inspirasi berkontraksi secara optimal sehingga kapasitas fungsional lebih meningkat begitupun dengan kualitas endotel vaskuler. Kualitas endotel vaskuler dapat dilihat dari aktivitas trombosit. Aktivitas trombosit dilihat dengan melihat ukuran trombosit (*mean platelet volume/MPV*)

**Tujuan:** Mengkaji pengaruh penambahan *elastic taping* pada latihan otot inspirasi (*IMT*) terhadap aktivitas trombosit pelari rekreasional.

**Metode:** Subyek penelitian merupakan pelari rekreasional yang memenuhi kriteria inklusi dan tidak memiliki kriteria eksklusi (n=14). Subyek dibagi secara random ke dalam 2 kelompok, yaitu kelompok yang mendapat latihan otot inspirasi dengan *pressure threshold IMT* dan *elastic taping* dan latihan otot inspirasi dengan *pressure threshold IMT* saja. Frekuensi latihan nafas dua kali sehari 30 repetisi, lima kali seminggu dengan tahanan 60% dari 30 RM dilakukan di rumah kelompok penelitian, sedangkan frekuensi berlari tiga kali seminggu dengan kecepatan 4,5 mph inklinasi 0% dilaksanakan pada Poli Rawat Jalan Instalasi Rehabilitasi Medik RSUD Dr. Soetomo Surabaya. Dosis 30 RM disesuaikan setiap minggu. Pengukuran *MPV* dilakukan dengan pemeriksaan darah menggunakan *Hematology Analyzer Sysmex XN 1000 B3/A1* pada minggu pertama sebelum latihan dan setelah 4 minggu latihan.

**Hasil:** Terdapat tren penghambatan peningkatan *MPV* pada latihan otot inspirasi dengan *pressure threshold IMT* dan *elastic taping* ( $p=0,88$ , CI 95%) dan peningkatan *MPV* pada kelompok dengan *pressure threshold IMT* saja pasca 4 minggu latihan. Tidak terdapat perbedaan bermakna diantara kedua kelompok ( $p=0,33$ , CI 95%). Besar pengaruh *elastic taping* pada latihan otot inspirasi dengan *pressure threshold IMT* 99%.

**Kesimpulan:** Latihan otot inspirasi dengan *pressure threshold IMT* dan *elastic taping* menunjukkan tren yang lebih baik dalam menghambat aktivitas trombosit pelari rekreasional.

**Kata kunci:** *pressure threshold IMT*, *elastic taping*, pelari rekreasional, mean platelet volume, aktivitas trombosit.

**ABSTRACT****Effects of Elastic Taping on Inspiratory Muscle Exercise with Pressure Threshold IMT on the Recreational Runner's Platelet Activity In Surabaya**

Asriningrum, Damayanti Tinduh, S.M Mei Wulan

**Background:** Regular running can increase exercise capacity and quality of vascular endothelium. Breathing exercises using pressure threshold inspiratory muscle training (IMT) can improve exercise capacity which also has the possibility to improve vascular endothelium. The addition of elastic taping to the thoracic wall during exercise allows the inspiratory muscles to contract optimally so that the functional capacity and vascular endothelial quality can increase optimally. Endothelium quality can be assessed by evaluating the platelet activity, such as by measuring the mean platelet volume (MPV) in response to endothelial damage. In this study we examined whether the addition of elastic taping to pressure threshold IMT can lead to further improvement of the endothelium quality, indicated by the decrease in the mean platelet volume.

**Objective:** To examine the effect of elastic taping on inspiratory muscle training on recreational runner's platelet activity.

**Method:** Research subjects were 14 - recreational runners who met the inclusion criteria. Subjects were divided into two groups, pressure threshold IMT with elastic taping and pressure threshold IMT without elastic taping. The breathing exercises were done twice -a day, with 30 repetitions, five times a week with resistance 60% of 30 RM. Running exercises were done three times a week with a treadmill (with the speed of 4.5 mph and 0% inclination) at the Physical Medicine and Rehabilitation Department of Dr. Soetomo Hospital. RM 30 doses were adjusted every week. Platelet activity measurements were carried out in the first week before exercise and after four weeks of exercise using *Hematology Analyzer Sysmex XN 1000 B3/A1* as Mean Platelet Volume (MPV).

**Results:** Within the same group, there was an inhibition trend of MPV enlargement in the pressure threshold IMT and elastic taping group ( $p = 0.88$ , CI 95%) and an increase of MPV in the pressure threshold IMT alone group after four weeks of exercise. However, there was no significant differences in the change of MPV value between the two groups ( $p = 0.33$ , CI 95%). The influence of elastic taping application is 99% ( $r^2=0,99$ ).

**Conclusion:** Inspiratory muscle training using pressure threshold IMT and elastic taping showed a better trend in delayed recreational platelet runner activity.

**Keywords:** pressure threshold IMT, elastic taping, recreational runners, mean platelet volume, platelet activity, endothel quality.