RINGKASAN

EFEK PEMBERIAN LATIHAN RENANG INTENSITAS RINGAN DIBANDING INTENSITAS BERAT TERHADAP LUAS AREA POTONGAN MELINTANG, JUMLAH SEL FIBROBLAS DAN TEBAL SERAT *SHARPEY* PADA TENDON ACHILES TIKUS PUTIH (*Rattus norvegicus* galur *Wistar*) JANTAN

Latihan fisik menyebabkan terjadinya peningkatan sintesa kolagen pada tendon. Akibat latihan fisik maka akan terjadi beberapa perubahan pada tendon antara lain peningkatan luas area potongan melintang tendon, peningkatan jumlah sel fibroblas, dan peningkatan tebal serat *sharpey*. Perubahan tersebut menyebabkan kekuatan daya rentang tendon juga bertambah. Tetapi pada kenyataannya dalam aktifitas fisik tendon sering mengalami resiko cidera akibat beban yang diterima melebihi kemampuannya. Sampai saat ini belum diketahui secara jelas intensitas latihan mana yang lebih berpengaruh terhadap peningkatan luas area potongan melintang, jumlah sel fibroblas dan tebal serat *sharpey*.

Tendon merupakan jaringan ikat yang menghubungkan otot dengan tulang. Tendon sebagian besar terdiri dari kolagen yang dihasilkan oleh fibroblas. Fibroblas adalah sel paling umum pada jaringan ikat dan satu-satunya sel yang terdapat pada tendon. Perlekatan tendon dengan tulang didaerah insersionya begitu kuat karena serat kolagen masuk ke dalam matrik tulang dan menyebar di dalamnya, serat ini disebut serat *sharpey*. Stres mekanis pada tendon mengakibatkan mekanotransduksi dan akan menstimulasi integrin untuk mentransmisikan sinyal transduksi dari luar ke dalam sel fibroblas. Hal ini akan meningkatkan pembentukan kolagen tipe I oleh sel fibroblas. Peningkatan produk kolagen tipe I ini akan meningkatkan serat kolagen pada tendon dan dalam matrik tulang. Dengan demikian akan terjadi beberapa perubahan pada tendon akibat latihan fisik antara lain terjadi peningkatan luas area potongan melintang tendon, peningkatan jumlah sel fibroblas dan peningkatan tebal serat *sharpey*.

Penelitian eksperimental laboratories ini bertujuan untuk membuktikan efek latihan renang intensitas ringan dan berat terhadap peningkatan luas area potongan melintang, jumlah sel fibroblas dan tebal serat *sharpey* pada tendon achiles.

Penelitian ini menggunakan rancangan *separate sample pretest-posttest control group design* dengan hewan coba tikus putih (*Rattus norvegicus* galur *Wistar*) Jantan, umur sekitar 3 minggu, sebanyak 28 ekor. Dua jenis perlakuan yang diberikan adalah (1) latihan renang intensitas ringan (dengan pemberian beban 3% BB) dan (2) latihan renang intensitas berat (dengan pemberian beban 9% BB). Data yang diperoleh dianalisis dengan statistik deskriptif, MANOVA dan uji deskriminan.

Hasil penelitian menunjukkan bahwa latihan renang intensitas ringan dan latihan renang intensitas berat meningkatkan luas area potongan melintang, jumlah sel fibroblas dan tebal serat *sharpey* dibanding dengan kontrol *posttest*. Hasil uji manova terhadap respon perubahan akibat perlakuan dapatkan bahwa

perlakuan memberikan perbedaan yang signifikan (*Holtelling's trace*, p<0,05). Dari hasil uji deskriminan tampak bahwa variabel jumlah sel fibroblas dan tebal serat *sharpey* memperlihatkan ada kontribusi bermakna respon perubahan akibat perlakuan (p<0,05), sedangkan variabel luas area potongan melintang tidak menunjukkan kontribusi bermakna respon perubahan akibat perlakuan (p>0,05).

Hasil penelitian ini dapat disimpulkan bahwa pemberian latihan renang intensitas ringan dan berat dapat meningkatkan luas area potongan melintang, jumlah sel fibroblas dan tebal serat *sharpey*. Variabel jumlah sel fibroblas dan tebal serat *sharpey* menunjukkan kontribusi bermakna respon perubahan akibat perlakuan sedangkan variabel luas area potongan melintang tidak menunjukkan kontribusi bermakna.

SUMMARY

THE EFFECT OF LIGHT INTENSITY OF SWIM TRAINING COMPARED TO HEAVY INTENSITY TO WIDE AREA OF CROSS SECTION, AMOUNT OF FIBROBLAS CELL AND THICK OF SHARPEY'S FIBRE AT ACHILES TENDON OF MALE WHITE RAT (Rattus norvegicus strain Wistar)

Physical training cause the happening of improve collagen sintesa at tendon. Effect of physical training hence will happened some change at tendon for example improve wide area of cross section, improve amount of fibroblast cell, and improve thick of sharpey's fibre. The change cause strength of energy span tendon also increase. But practically in physical activity, tendon often experience of risk, effect of accepted burden exceed its ability. Till now not yet been known clearly which training intensity is which more having an effect on to improvement of wide area cross section, amount of fibroblast cell and thick of sharpey's fibre.

Tendon represent network fasten connective of muscle with bone. Tendon most consisting of collagen yielded by fibroblast cell. Fibroblast is cell most commonly at network fasten and single cell found on tendon. Tendon juxtaposition with its area bone of strong him so because collagen fibre come into bone matrik and disseminate in it, this fibre is referred as sharpey's fibre. Mechanical Stress at tendon result mecanotransduction and stimulate of integrin for the transmission transduction signal from outside into fibroblast cell. This matter will improve forming of type collagen of I by fibroblast cell. Make-Up of type collagen product of I this will improve collagen fibre at tendon and in matric bone. Thereby will happened some change at tendon effect of physical training for example happened improve wide area of tendon cross section, amount of fibroblast cell and thick of sharpey's fibre.

The objective of this study was to prove that light intensity and heavy intensity of swim training can improve wide area of cross section, amount of fibroblas cell and thick of sharpey's fibre at achiles tendon.

This study used separate sample pretest-posttest control group design, with experimental animals the white rat (Rattus norvegicus strain Wistar) Male, age

around 3 weeks, counted 28 tails. Two treatment type that given were (1) light intensity of swim training (with giving of burden 3% Body Weight) and (2) heavy intensity of swim training (with giving of burden 9% Body Weight). Data is analysis by descriptive statistic, MANOVA and deskriminan test.

Result of study was showed light intensity of swim training and heavy intensity, to be increasing of wide area of cross section, amount of fibroblas cell and thick of sharpey's fibre compare to posttest control. MANOVA test result to respon change of treatment effect which get that treatment give significant difference (Trace Holtelling's, $p<0,05$). From deskriminan test result was showed variable amount of fibroblas cell and thick of sharpey's fibre showing that have significant contribution of change response of treatment ($p<0,05$), while variable wide area of cross section not showed significant contribution have a meaning of response change of treatment effect ($p>0,05$).

That concluded which light intensity of swim training and heavy intensity would be increase wide area of cross section, amount of fibroblast cell and thick of sharpey's fibre. Variable amount of fibroblas cell and thick of sharpey's fibre showing that have significant contribution of change response of treatment, mean while variable wide area of cross section not showed significant contribution

ABSTRAK

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Yulian Wiji Utami

Penelitian ini bertujuan untuk membuktikan efek latihan renang intensitas ringan dibanding intensitas berat terhadap peningkatan luas area potongan melintang, jumlah sel fibroblas dan tebal serat *sharpey* pada tendon achiles.

Rancangan penelitian menggunakan *separate sample pretest-posttest control group design* dengan hewan coba tikus putih (*Rattus norvegicus* galur *Wistar*) Jantan, umur sekitar 3 minggu, sebanyak 28 ekor. Dua jenis perlakuan yang diberikan adalah (1) latihan renang intensitas ringan (dengan pemberian beban 3% BB) dan (2) latihan renang intensitas berat (dengan pemberian beban 9% BB). Data yang diperoleh dianalisis dengan statistik deskriptif, MANOVA dan uji deskriminan dengan taraf kepercayaan 95%.

Hasil penelitian menunjukkan latihan renang intensitas ringan dan latihan renang intensitas berat meningkatkan luas area potongan melintang, jumlah sel fibroblas dan tebal serat *sharpey* dibanding dengan kontrol *posttest*. Hasil uji manova terhadap respon perubahan akibat perlakuan dapatkan bahwa perlakuan memberikan perbedaan yang signifikan (*Holtelling's trace*, $p<0,05$). Dari hasil uji deskriminan tampak bahwa variabel jumlah sel fibroblas dan tebal serat *sharpey* memperlihatkan ada kontribusi bermakna respon perubahan akibat perlakuan ($p<0,05$), sedangkan variabel luas area potongan melintang tidak menunjukkan kontribusi bermakna respon perubahan akibat perlakuan ($p>0,05$).

Dapat disimpulkan bahwa pemberian latihan renang intensitas ringan dan berat dapat meningkatkan luas area potongan melintang, jumlah sel fibroblas dan tebal serat *sharpey*. Variabel jumlah sel fibroblas dan tebal serat *sharpey* menunjukkan kontribusi bermakna respon perubahan akibat perlakuan sedangkan variabel luas area potongan melintang tidak menunjukkan kontribusi bermakna.

Kata kunci : latihan renang intensitas ringan, latihan renang intensitas berat, luas area potongan melintang, jumlah sel fibroblas, tebal serat *sharpey*

ABSTRACT

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Keyword : light intensity of swim training, heavy intensity of swim training, wide area of cross section, amount of fibroblas cell, thick of sharpey's fibre.