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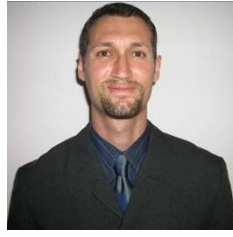
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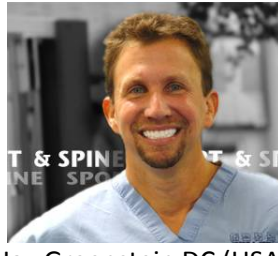
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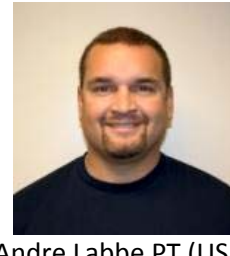
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## **The Effects of Dose and Application of Menthol on Local and Systemic Strength and Blood Flow**

**Robert Topp**, RN, PhD, Lee Winchester, MS, Jessica Schilero, BS, Patrick Abi-Nader, BS, Andrew Gibb, BS, & Dean E Jacks, PhD

The purpose of this study is to compare the peak quadriceps strength and popliteal artery blood flow in both the treated and untreated legs under three treatment conditions (3.5 % menthol, wipe with 10% menthol, and a control condition with no application of menthol). 16 healthy young adults (mean age = 24±2.97, mean body fat percentage = 17.61±6.35, male = 50 %, female = 50%) were recruited to participate in a 3 week protocol. Prior to undergoing any data collection session all subjects completed written informed consent and a familiarization trial in order to acquaint them with the blood flow and leg strength data collection protocols. Following this familiarization trial subjects completed a data collection session once per week for the next three weeks. One of three randomly applied treatments (3 ml of menthol 3.5% ointment, 1 menthol wipe 10% and a non treatment control) were applied to individual subjects right thigh. Following obtaining the subject's informed consent subjects were assessed at baseline for popliteal blood flow (ml/min) and arterial diameter (mm) in both legs using a Doppler ultra sound. Following this initial assessment of blood flow each subject's maximum isokinetic leg extension (quadriceps) and flexion (hamstring) (max torque in kg) in both legs were assessed. Immediately following this baseline blood flow and strength assessment a treatment was applied to the subject's circumferential right thigh from the knee to the inguinal fold. At 5 minutes following the application of the treatment blood flow was again assessed in both legs. At 15, 25 and 35 minutes following the application

of the treatment maximum leg extension (quadriceps) and flexion (hamstring) in the leg where the treatment was applied was again assessed. Repeated measures analysis and Fisher's LSD post hoc analysis ( $p < .05$ ) addressing significant main and interaction effects was employed to address the study hypotheses. This analysis indicated a significant interaction of time by group on the arterial blood flow or arterial diameter of the right leg. When menthol 3.5% ointment was applied blood flow and arterial diameter in the right leg declined significantly. The menthol wipe had no significant effect on blood flow with a significant decrease in arterial diameter. Under the control condition the right leg blood flow and arterial diameter significantly increased. The left leg which did not receive direct treatment the menthol 3.5% ointment treatment resulted in significant declines in blood flow on the left while arterial diameter in the left leg did not change. The menthol wipe treatment did not change blood flow or arterial diameter in the left leg. Under the control condition the blood flow significantly increased in the left leg with no change in arterial diameter. No significant differences within or between treatment groups were observed over the four data collection points at which strength was assessed. These findings indicate that menthol 3.5% ointment significantly reduced blood flow and arterial diameter in the leg where the treatment was applied and appears to significantly reduce blood flow in the contralateral leg indicating a systemic effect of the treatment. The menthol wipe did not effect blood flow in the treatment leg but exhibited lower blood flow compared with the control condition. The menthol wipe did reduce arterial diameter in the treatment leg with no impact in the contralateral leg. No treatment had a significant effect on strength in either leg. The differences in the effects of menthol 3.5% ointment and the menthol wipe may be attributable to the medium in which the menthol is suspended.

## **The Effects of Combined Topical Menthol and Ice on Distal Blood Flow**

**Robert Topp**, RN, PhD, Elizabeth R. Ledford, BS, Patrick Abi-Nader, BS, Jessica Schilero, BS, & Dean E Jacks, PhD

The purpose of this study is to compare radial artery blood flow at 1, 5, 10, 15 and 20 minutes during the application the right forearm of one of four conditions 1) 3.5 ml menthol (3.5 %), 2) .5 Kg of ice, 3) 3.5 ml of menthol (3.5%) and .5 Kg of ice, 4) control of no treatment. 18 healthy young (mean age = 25.70±3.98years height = 68.67±3.7inches, weight=175.50±45.70) adults (male 61%, female 39%) volunteered to participate in trial which involved four data collection sessions separated by at least 48 hours. Prior to undergoing any data collection session all subjects completed a written informed consent and a familiarization trial in order to acquaint them with the data collection protocols. Data collection consisted of measuring the right radial artery diameter (cm), blood flow (ml/min) through the right radial artery, and heart rate (b/min) prior to the application of any treatment (baseline) and again at 1, 5, 10 15 & 20 minutes following treatment application. A subjective measure of intensity of the treatment (0=none, 10=worst possible) was also assessed at 1, 5, 10 15 & 20 minutes following the application of the three treatments. Radial artery diameter and blood flow was assessed using a Doppler ultra sound. Heart rate was assessed by palpating the contralateral radial artery for one minute. Each data collection session involved application of one of four randomly applied treatments to the subject's right forearm. Repeated measures ANOVA with treatment, time and interaction of treatment and time was used to determine any within, between or interaction effects of the treatments on the outcome measures. Significant main or interaction effects were addressed further through calculating Fischer's Least Significant Differences to detect differences between the treatment/time

means ( $p<.05$ ). This analysis indicated that heart rate and radial artery diameter did not significantly change within or between groups from their pretreatment baseline measures over the course of data collection. Blood flow indicated a significant treatment, time and interaction effect. The control condition did not change blood flow over the duration of the trial. All three treatments resulted in significant declines in blood flow at 1, 5, 10 and 15 minutes following application of the respective therapy with peaks in blood flow reductions being 26% in the menthol treatment, 28% in the ice treatment and 40% in the combined menthol and ice treatment. At the 20 minute data collection point both the ice and combination treatment demonstrated reduced blood flow compared to baseline while the blood flow under the menthol treatment was not different between baseline and the 20 minute data collection points. At the 5, 10, 15 and 20 minute data collection points the blood flow of the combination treatment was also significantly lower than the menthol treatment. Intensity of the treatment also indicated a significant treatment, time and interaction effect. The menthol and ice treatments produced similar patterns in reducing blood flow at all data collection points. The intensity of the menthol treatment was significantly less than the ice and the combination treatment at 1 minute following application. The ice remained of a higher intensity than the menthol at the 5 minute data collection point only while the intensity of combination treatment was not different in intensity than the menthol at the 10, 15 or 20 minutes data collection points. These findings indicate that menthol has a significant effect at reducing peripheral blood flow distal to application similar to that of ice and that combining ice with menthol may have a potentiating effect on reducing blood flow over using menthol alone. The perceived intensity of menthol alone was significantly less than ice or menthol combined with ice during the initial phases of treatment.

## **Effects of prehabilitation on early rehabilitation of TKA – A pilot study**

**Robert Topp**, PhD, RN, Anthony Brosky, DSPT<sub>c</sub>, Kent Brown, PhD<sub>c</sub>

**Purpose/Hypothesis** : The purpose of this study was to examine the effect of a preoperative (prehabilitation) exercise program on the performance of selected functional performance tasks before and after total knee arthroplasty (TKA) in adults with knee osteoarthritis (OA).

**Number of Subjects** : Eighteen adults with knee OA scheduled for unilateral TKA.

**Materials/Methods** : A repeated measures design was used to compare 2 groups of community dwelling adults with knee OA over four data collection points: T1 (8 weeks before surgery), T2 (1 week before surgery), T3 (1 week after surgery), and T4 (2 weeks after surgery). Participants were recruited from a single orthopaedic surgeon's office. Following baseline testing (T1) participants were randomized into a control (CON, n=9, mean age=59.5, mean BMI=38.4) or prehabilitation group (PRE, n=9, mean age=60.4, mean BMI=36.2). The CON group received the usual care of a single pre-operative education visit 1-2 weeks prior to surgery. The PRE group was instructed in an exercise program that included resistance training, step training, and flexibility exercises performed 3 times per week. One exercise session was supervised each week and compliance was recorded in an exercise log book resulting in an average of 16 sessions. The functional performance tasks measured included the 6 minute walk test (6MWT), the timed up and go (TUG), the 30 second chair stands test (CST), and stair climbing tasks both up and down a flight of 19 stairs.

**Results** : Repeated measures ANOVA indicated significant differences ( $p < .05$ ) between the PRE and CON groups during the preoperative (T2) and post-operative (T3 and T4) data collection

points. At T2 the PRE group demonstrated superior performance on the TUG and the 30 second CST. Post-operatively at either T3 or T4, the PRE group performed superior to the CON group on the TUG, the 30 second CST, and both stair climbing tasks (up and down).

**Conclusions** : The findings of the current study indicate preoperative exercise programs may improve the performance on selected functional tasks in patients with knee OA who are scheduled for TKA. Future research is needed with larger samples to determine optimal parameters of exercise volume, dosage, and intensity and investigate cost-effectiveness models and compliance strategies.

**Clinical Relevance** : This study suggests partially supervised pre-surgical exercise programs may improve pre-operative and post-operative functional status in patients with knee OA who are scheduled for TKA.

## **A comparison of clinical force production between Thera-Band® elastic exercise bands, latex free bands, and elastic tubing**

**Labbe** A<sup>1</sup>, Page P<sup>2</sup>, Topp R<sup>3</sup>. 1 A&K Physical Therapy, New Orleans LA, 2. Hygenic Corporation, Baton Rouge LA, 3. University of Louisville, KY

Thera-Band® brand bands and tubing are purported to provide the same levels of resistance between colors. The purpose of this study was to determine and compare the resistance levels produced by colors of the Thera-Band system of progressive resistance in 3 different types of elastic resistance: latex bands, latex-free bands, and latex tubing.

**Methods.** 2 random samples in 12 inch lengths of all 3 types of elastic were sampled from 3 different lots. 5 colors were tested: yellow, red, green, blue, and black. The starting length of the material was pre-stretched 5 times to 250% to establish the baseline length. Samples were affixed to a force transducer (Noraxon USA) on one end, and a Thera-Band handle on the other end. Force in pounds was measured while slowly stretching the material every 50% elongation to 250% elongation. Samples were held for 3 seconds at each 50% elongation. 3 repetitions were performed for each sample.

**Data Analysis.** Only the 2<sup>nd</sup> and 3<sup>rd</sup> pulls were analyzed to ensure adequate fixation of the sample after the first pull. The middle second hold at each 50% elongation was used to determine the force produced with MyoResearch software (Noraxon USA). A repeated measures ANOVA was used to

determine main effects between the 3 types of elastic resistance across 5 colored resistance levels. Significance was set at  $p < .05$ . Post hoc analysis using Tukey's Least Significant Difference was used to determine individual differences.

**Results.** Descriptive statistics included average force by percent elongation and percent increase in force between colors at 100% elongation. All products produced similar linear force curves. At 100% elongation, bands increased 11-23% from their previous color, latex free from 17-27%, and tubing from 17-23%. Latex free generally produced less force than bands or tubing except in the black color. Statistically, there was no significant difference between the types of elastic at any elongation within yellow, red or blue colors; however, each type of elastic was significantly different from each within the green color at all elongations. Black tubing was significantly greater than bands or latex free bands at all elongations except 50%.

**Conclusion.** The Thera-Band colors of elastic resistance products (latex bands and tubing, and latex free bands) produce similar force profiles throughout the clinical elongation to 250%. While green and black products demonstrated statistically significant differences between products, these differences may not be clinically significant. Clinicians should remain confident Thera-Band products produce similar forces within the same color regardless if it is a band, tubing, or latex free band.

Type	color	50%	100%	150%	200%	250%
band	yellow	2.35	3.61	4.54	5.46	6.4
latexfree	yellow	2.34	3.27	3.96	4.8	6.1
tubing	yellow	2.3	3.6	4.64	5.61	6.77
band	red	3.07	4.61	5.76	6.82	7.96
latexfree	red	2.99	4.22	5.11	6.11	7.66
tubing	red	2.82	4.36	5.48	6.53	7.75
band	green	4.06	6.01	7.5	9.01	10.63
latexfree	green	3.59	5.07	6.12	7.19	8.61
tubing	green	3.45	5.5	6.89	8.24	10.01
band	blue	4.5	6.76	8.45	10.01	11.67
latexfree	blue	4.78	6.91	8.38	9.85	11.81
tubing	blue	4.69	7.14	8.74	10.38	12.31
band	black	5.6	8.3	10.31	12.23	14.2
latexfree	black	6.12	9.06	10.99	12.89	15.28
tubing	black	5.62	9.23	11.94	14.23	16.95

Force in pounds at each elongation by product type

band	red	22%
latexfree	red	23%
tubing	red	17%
band	green	23%
latexfree	green	17%
tubing	green	21%
band	blue	11%
latexfree	blue	27%
tubing	blue	23%
band	black	19%
latexfree	black	24%
tubing	black	23%

% increase in force at 100% elongation from previous color

## EMG analysis of a novel eccentric exercise for the treatment of tennis elbow

Labbe A<sup>1</sup>, Page P<sup>2</sup>. <sup>1</sup>A&K Physical Therapy, New Orleans La. <sup>2</sup>Hygenic Corporation, Baton Rouge LA.

A novel exercise has recently been shown to be effective in the treatment of lateral epicondylalgia (“tennis elbow” disorder). This exercise (the “Tyler Twist”) was designed to produce pure eccentric loading to the common wrist extensors using a Thera-Band® Flexbar. The purpose of this pilot study is to investigate the EMG activity of the wrist extensors/ flexors while performing this exercise.

**Method:** Five healthy subjects without any upper extremity pathology participated. Surface EMG data was collected from the wrist flexors (flexor carpi ulnaris (FCU) and flexor carpi radialis (FCR)) and extensors (extensor carpi ulnaris (ECU) and extensor carpi radialis (ECR)) and MVIC was established. An inclinometer was also placed on the dorsum of the hand to measure ROM of the wrist during the exercise. Each subject was instructed in the proper technique of the “Tyler Twist” exercise. Each subject used the red Flex Bar and performed 5 repetitions.

**Data Analysis:** Raw EMG data was rectified and smoothed using RMS. The middle three repetitions were used for analysis. Each repetition was divided into three phases from the inclinometer data: Load, Set, and Eccentric. *Load phase*- Starting position with test elbow at 90 degrees and and Flexbar held in hand while opposite hand twists the bar. *Set phase*- both elbows extended with “twist” maintained. *Eccentric phase*- active wrist starts to flex to “untwist” the flex bar. The mean activation of each phase was normalized to MVIC. Each

phase was then averaged across all subjects to determine average %MVIC for each muscle.

**Results:** Load phase: The flexor group was activated less than the extensor group (FCR =28% MVIC, FCU=19%MVIC; ECR=38%MVIC, ECU=47%MVIC ). The ECU was 40% greater than the FCU. Set phase: FCR and ECU all maintained their activation level from the load phase (FCR= 25%MVIC, ECU =47%MVIC). ECR had a 31% decrease in activation from the load phase (ECR =28%MVIC ) and FCU had a 24% increase in activation (FCU =25%MVIC). Eccentric phase: There was a 40% decrease in extensor activation (ECU =30%MVIC, ECR=20%MVIC) and a 20% increase in FCU activation during this final phase (FCU 30%MVIC,FCR 26%MVIC). FCR remained the same from the set phase.

Regarding the muscle activation, extensors decreased in %MVIC during all phases (ECR=47% decrease, ECU=36% decrease). FCU had an overall 40% increase in activation from the load phase to the final eccentric phase. FCR maintained a similar amount of muscle activity throughout the exercise, slightly decreasing after the first phase (28-26%MVIC).The ratio of FCR:ECR increased throughout all phases from .70 to 1.28. The ratio of FCU: ECU also increased throughout the exercise from .40 to 1.0 during the last phase.

**Conclusion:** There is a decrease in wrist extensor activity throughout the Tyler Twist exercise. There is a notable increase in flexor FCU activity during the exercise, which appears to be due to natural ulnar deviation of the wrist during the end of the eccentric phase when the wrist is flexing. The ratios indicate the success of this exercise could be due to its ability to activate the extensors more than the flexor during latter phases.

## **ROTATOR CUFF AND SCAPULAR MUSCLE ACTIVATION DURING EXTERNAL ROTATION OSCILLATION & AND RESISTED WALL WALK ELEVATION EXERCISES WITH ELASTIC RESISTANCE**

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The use of elastic resistance exercise during shoulder rehabilitation is a common practice in orthopaedic and sports physical therapy. Several key exercises are used to increase rotator cuff strength and scapular stabilization using elastic tubing, elastic band loops, and the Thera-Band® Flexbar. While these exercises have been included in published reports of shoulder rehabilitation methods, the exact muscular activation levels of the rotator cuff and scapular muscles is presently unknown during these exercises. The purpose of this study was to measure rotator cuff and scapular muscular activation using surface EMG during the performance of two important exercises; external rotation oscillation (ERO) and upper extremity wall walk elevation (WWE). **METHODS:** 21 subjects were recruited for this study who were free from present shoulder injury and without surgical history of shoulder pathology. Subjects had muscular activity monitored using surface electrodes with a Noraxon EMG unit using standard preparation and normalization techniques. Muscles sampled were the infraspinatus (INF), middle (MD) and posterior deltoid (PD), serratus anterior (SA), and upper (UT) and lower trapezius (LT). ERO was performed using a Thera-Band Flexbar and red Thera-Band tubing at 100 % elongation using the Thera-Band Wall Station. Subjects were positioned with a towel roll under the axilla placing the glenohumeral joint in 20 degrees of elevation in the scapular plane. A ten- second duration of oscillation exercise was sampled for data analysis and post-processing using standardized filtering and

normalization procedures. An external rotation isometric hold (ERH) was also tested in randomized order with red tubing to assess the difference in muscular activation between oscillation and an isometric hold. The dominant arm was used in all trials. The WWE exercise was studied using a 60-90 degree arc of elevation in three unilateral steps. Subjects performed 3 repetitions with the forearms spaced 12 inches apart against a wall. The middle repetition was used to sample EMG activity during both the ascent and descent phases of the exercise. Subjects were positioned 12-18 inches away from the wall. A comparison between muscular activation levels with no resistance and a yellow Thera-band loop was performed. The order of testing was again randomized. Statistical analysis consisted of descriptive statistics profiling average normalized EMG activity of the rotator cuff and scapular muscles as well as 2 ANOVAs comparing the effect of differing levels of resistance on muscular activity between ERO and ERH as well as WWE with and without resistance. **RESULTS:** Significantly greater INF, MD, PD and UT muscular activation was found during ERO as compared to the ERH with no significant difference identified in any muscle between the WWE with and without the application of a Thera-Band loop. Average normalized muscle activation levels during the ERO exercise were 21.5% INF, 6.25% PD, 2.9% MD, 3.5% SA, 14.6% LT, 10.4 % UT while wall walking with resistance produced levels of muscular activity of 21.3% INF, 2.43% PD, 5.31% MD, 17.6% SA, 18.7% LT, 16.9 UT.

**Clinical Application:** The application of this research to clinical practice includes increasing the level of known muscular activation during these two commonly used shoulder rehabilitation exercises. This research provides the clinician with added objective information regarding the muscular activation and relative contribution of various rotator cuff and scapular muscles during these key exercises and the effects of oscillation and band loop resistance. This information will provide clinicians with

evidence regarding the true muscular activity during exercise they choose to increase

strength and scapular stabilization during shoulder rehabilitation.

### The Effects of Biofreeze® on Self Discharge Rates: A Multi-Center Pilot Study

**Timothy Tyler, PT, MS, ATC**  
Barton N. Bishop, DPT, SCS, CKTP, CSCS

**Background:** For private practice clinicians, patients who present for their initial evaluation and then don't return for follow up care are a challenge for not only patient improvement, but for the business. This is commonly defined as a self discharge. The rate of self discharge (numbers of self discharges divided into the total new patients presenting) has been followed in 4 outpatient chiropractic clinics and 1 outpatient physical therapy clinic over a 3 year period. There were a few purposes of this study: (1) To determine the rate of self discharge in these clinical settings, (2) to determine the most common conditions in those self discharging patients, and (3) to

determine if the application of Biofreeze® both in the clinic and at home decreases the rate of self discharge. Previous studies have shown that the application of Biofreeze® on the first visit in patients with acute, bilateral neck pain gives greater pain reduction, lasts longer, and is more comfortable for the patient than ice. The investigation is designed to determine result in a decrease in self discharge rates.

**Intervention:** All patients presenting for an initial evaluation received an application of Biofreeze® spray on their area of chief complaint while in the clinic, but at the end of their visit. The patients also performed therapeutic exercises, receives appropriate manual therapy, and appropriate modalities. For their home care, they received a bottle of Biofreeze® spray for pain relief and a home exercise program.

#### Historical Results:

Practice	Year	Total Evals	Total Self Discharges	% Self Discharges	Conditions
Chiropractic	2007	2074	75	3.6%	1. Neck, 2. Low Back, 3. SI
	2008	2097	85	4.0%	1. Neck, 2. Low Back, 3. Myalgia
	2009	2291	78	3.4%	1. Neck, 2. SI, 3. Low Back
Phys Therapy	2006	781	43	6.8%	1. LBP, 2. Ankle, 3. Shoulder
	2007	728	38	5.2%	1. Ankle, 2. LBP, 3. Shoulder
	2008	777	62	7.9%	1. Ankle, 2. LBP, 3. Meniscus

#### Results:

Practice	Dates	Total Evals	Total Self Discharges	% Self Discharges	p-value
Chiropractic	2010 Jan-April	792	21	2.7%	P=.017
Phys Ther	2010 Jan-May	316	5	1.6%	P=.0008

**Conclusions:** The addition of Biofreeze® during initial evaluation and given for home usage significantly decreased the number of self

discharges in the physical therapy clinic. This same significant reduction in self discharges was not seen in the chiropractic clinics.

## Effect of concurrent aerobic and resistance circuit exercise training using the Thera-Band® Exercise Station in older adults

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**PURPOSE:** The aim of this project was to evaluate the effects of a 12-wk community-based circuit exercise training program using the Thera-Band Exercise Station on fitness in older men and women. In addition, results of this study were compared to our previous study of a similar program using hydraulic exercise machines. **METHOD:** Following baseline measurements of functional fitness, body composition, aerobic capacity, muscular strength and flexibility, the participants were divided into: Thera-Band Exercise Station exercise group (n=22; 67.7±4.7 yr) and a non-exercise control group (n=17; 70.3±9.1 yr). The exercise group participated in a 12-wk circuit training program, 3 sessions per wk and 50 min per session. Each session was led by trained fitness instructors and supervised by the researchers. The exercise program consisted of stretching and warm-up exercise (10 min), circuit training (30 min), and cool-down/relaxation exercise (10 min). Twelve individual strength exercises designed to work all major muscle groups and 12 aerobic dance exercises were performed alternatively in a circuit manner each for 30 s with a heart rate of 100-110 bpm. The control group was instructed to continue their normal physical activity patterns. After 12 wk, all measurements were

repeated in both groups. **RESULTS:** Following the 12-wk program, the exercise group demonstrated increases ( $p<0.05$ ) in 30-sec arm curl (15.2%), 30-sec chair stand (12.5%), time up-and-go (8.1%), functional reach (4.9%), 12-min walk (5.3%), and sit-and-reach (24.7%). Although body weight did not change, fat (kg) decreased by 3.4% for the exercise group. Attendance rate for the exercise sessions was 87%. There were no changes in any variables for the control group. Previously, we published (Takeshima, Rogers, et al., *Eur J Appl Physiol*, 2004) results of a similar circuit training program using hydraulic exercise machines in 18 older adults (68.3±4.9 yr). Results were not different between these two programs. **CONCLUSIONS:** Incorporating both aerobic and resistance training via the Thera-Band Exercise Station is an effective means to improve multiple aspects of fitness with a single exercise program when performed at a moderate intensity. These results indicate that the Thera-Band Exercise Station elicits significant improvements of fitness in older adults and these improvements are similar to those resulting from use of larger and more expensive hydraulic exercise machines. **CLINICAL APPLICATION:** This study evaluated the Thera-Band Exercise Station, a product with little, if any, research to support its use in fitness settings nor with older adults. The Thera-Band Exercise Station is a relatively inexpensive means by which circuit training can be conducted in group settings with little requirement for space. This study supports the efficacy of this product for older adults and implementation of this program could feasibly be performed at retirement communities, senior centers, as well as in home settings.

## Varying the *amount* and *type* of social support provided during an older adult Well-Rounded Exercise Program (WellREP)

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**Michael E. Rogers**, PhD, CSCS, FACSM • Professor and Chair • Department of Human Performance Studies • Wichita State University • Wichita, Kansas, USA

**PURPOSE:** The aim of this project was to assess the efficacy of two models of delivery and support of a well-round physical exercise program (WellREP) for older adults: (1) a *home-based*, internet support driven program vs. (2) a *class-based*, internet support driven program. Models will be compared to two control groups (1) *home-based*, no support and (2) *class-based*, no support. Results reported represent the first phase of data collection and include the control groups: (1) *home-based*, no support and (2) *class-based*, no support. Updates to the program website are ongoing and are required to implement the internet support driven programs. Home and class-based WellREP interventions/data collection will begin January 24<sup>th</sup> with the 16 week intervention being completed May 16<sup>th</sup>. The start of these programs is delayed to allow all interventions to occur during the same seasons/weather patterns, and equalize motivating factors related to New Year's resolutions.

**METHOD:** Forty-nine females aged 65+ years were recruited from local community centers, senior centers, retirement communities, other senior-based programs and media publications. The WellREP intervention utilized the First Step to Active Health<sup>®</sup> program which was implemented 2 day/week for 16-weeks and involved flexibility, strength, balance, and cardio-respiratory training. The class-based WellREP was held at an area Senior Center and the home-based participants performed their activities at home. Program adherence was

assessed using class attendance, program effectiveness (pre vs post) was assessed using the Functional Fitness Battery (chair stand, arm curl, chair sit and reach, 8-foot up and go, scratch test, and 12-min walk); Measures of Balance (four-way limits of stability – Front (F), Back (B), Right (R), and Left (L)); Daily Physical Activity (pedometer steps); and Physical (height, weight, blood pressure, heart rate, body mass index).

**RESULTS:** Home-based Control: Twenty-six women (age = 64.9 ± 5.8 yrs) were recruited and completed the pre-assessment measures. Paired-samples t-tests ( $p < .05$ ) revealed significant change on all measures except flexibility. After 16 weeks, FF improvements were noted: Chair Stand 33%, Arm Curl 24%; Up-&-Go 8%; 12-min Walk 15%. With respect to LOS, two of the five measures improved. MXE improved in all directions (F 18%, R 7%, B 16%, L 9%) and DCL improved in the F direction 12%. DPA also increased from 3,065 to 6,049 steps.

Class-based Control: Twenty-three women (age = 69.2 ± 4.3 yrs) were recruited and completed the pre-assessment measures. Paired-samples t-tests ( $p < .05$ ) revealed significant change on all measures except flexibility. After 16 weeks, FF improvements were noted: Chair Stand 39%, Arm Curl 23%; Up-&-Go 9%; 12-min Walk 15%. With respect to LOS, there was no change in RT or MVL, EPE improved in all direction (F 22%, R 10%, B 26%, L 6%), MXE improved in all directions (F 28%, R 12%, B 21%, L 14%) and DCL improved in the F and B direction 21% and 11% respectively. DPA also increased from 3,425 to 5,521 steps.

Group Comparisons: No baseline difference existed between groups. Repeated measures ANOVAs revealed group x time interactions ( $p < .05$ ) for the balance measures, but not for the measures of functional fitness. With respect to functional fitness, univariate analysis indicates improvement was made across time, however there were no differences between groups. These findings indicate both groups improved equally as well and each setting was

sufficient to improve functional fitness. With respect to balance, the class-based program was superior to the home-based program. This was reflected in not only larger improvement within each measure, but also due to the fact that the home-based class improved on 2 of the 5 balance measures, whereas the class-based group improved on 3 of the 5 measures.

The average adherence for the class-based program was  $62.8 \pm 15.3\%$  (mean  $\pm$  SD) and for the home-based program was  $47.8.2 \pm 13.9\%$ . All participants completed post-assessment measures. Those who failed to attend more than 50% of the classes were eliminated prior to analysis. Eighteen participants (12 home- and 7 class-based) were excluded from the analysis because they attended fewer than 50% of the classes.

**CONCLUSIONS:** The group comparison results indicate that both programs are equally effective with respect to improving functional fitness and walking activity. However, the class-based program is superior in improving balance. The authors hypothesize that the strength and

cardio-activities required less supervision and progression may have been easier for these modes of exercises. The balance exercises may have been more novice to the home-based participants, resulting in participants taking a more gradually approach to progression. The slower progression likely led to the lack of balance improvement by the home-based participants. It is also important to note that the adherence rate for the class-based program was somewhat low at 63%, but still 15% better than the home-based program. Higher adherence rates are expected for the internet-supported groups.

**CLINICAL APPLICATION:** This project is clinically relevant with respect to 4 areas: internet-based physical activity programming for older adults; the use of internet technology to increase adherence and compliance; the theory-based nature of the project; and general information regarding the use of the program to improve functional fitness.

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## Benefits of the Wii Fit as an Exercise Program for Older Adults

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*School of Community Affairs, Gerontology, Department of Physical Therapy, Department of Human Performance Studies*

**Purpose:** To determine if Wii Fit is an effective older adult exercise program compared to a traditional exercise program (TRAD) with respect to functional fitness (FF) and balance. **Method:** Wii Fit women (n=4) were matched on sex, age, weight, and FF to TRAD subjects (Ss)(n=4) and a control group (CON)(n=4). Interventions were 8 wk, 50 min, 2d•wk and consisted of flexibility, strength,

and balance training. Wii group followed the Wii program and TRAD participated in a traditional class. Pre and post measures included FF (chair stand, arm curl, sit and reach, up & go, scratch test, and 12 min walk), Balance Limits of Stability (LOS): movement velocity (MVL), endpoint excursion (EPE), maximum EPE (MXE), and directional control (DCL). Results were evaluated using qualitative comparison due to small sample size. Percent change was calculated and group change was compared.

**Results:** No baseline difference existed. With respect to FF, Wii exhibited little change whereas, TRAD exhibited large changes, especially on measures of strength. With respect to FF, Wii exhibited little change whereas, TRAD exhibited large changes, especially on measures of strength. With respect to balance, Wii exhibited similar large changes compared to TRAD and on

some measures exceed TRAD on EPE, MXE, and DCL. Conclusions: Using Wii Fit appears to be as effective as TRAD for balance. Wii is

not effective in improving other measures of FF. Further research is warranted.

Table 1: % Changes for Balance Measures

	Reaction Time			Mean Velocity			End Point Excursion			Max Excursion			Directional Control		
	Wii	TRAD	CON	Wii	TRAD	CON	Wii	TRAD	CON	Wii	TRAD	CON	Wii	TRAD	CON
Front	-24	-17	7	18	5	4	26	23	-7	25	14	3	9	8	4
Back	-16	-16	-4	32	36	2	17	17	-10	22	24	9	39	2	4
Right	-20	-23	9	58	24	4	3	-6	-19	2	0	-11	4	1	1
Left	-37	-20	-9	43	24	12	9	4	-10	7	12	-9	7	4	-1

Table 2: % Changes for Functional Fitness

	Wii	TRAD	CON
Arm Curl	5	48	6
Chair Stand	11	59	0
Up & Go	-11	-14	3
12 Min Walk	10	9	0

## Results of a multi-component exercise and physical activity program using the First Step to Active Health® for sedentary, community-dwelling older adults

Pamela E. Toto, MS, OTR/L, BCG, FAOTA

**Objective:** Evaluate the effect of participation in the First Step to Active Health (FSAH) program by sedentary, community-dwelling older adults from low-income households on *physical activity, physical performance, ADL performance, and depression.*

**Background:** The health benefits of engaging in increased physical activity for older adults are well documented. However, less than 30% of older Americans engage in any form of regular physical activity. Despite the development of best practice recommendations for physical activity programs, there is limited research examining the impact of these programs, including the FSAH, on older adult participation and function.

### Methods:

**Participants:** Subjects (N = 19) were residents of a low-income senior public housing site. Inclusion criteria: Age 60+, resident at site, independent ambulation, no cognitive impairment, and reported low levels of physical activity. Exclusion criteria: Recent hospitalization, currently receiving OT or PT, in a formal exercise program, presence of a health condition for which exercise is contraindicated.

**Design:** A pre-post cohort study was completed, introducing a 10 week multi-component exercise and physical activity intervention program using the FSAH. Pre-test and post-test data was obtained through self-report and observation-based assessments. Results were analyzed using SPSS software.

**Measure(s):** Four assessments were administered as pre-test and post-test measures of the intervention's effectiveness. Physical activity was measured through self-report on the Yale Physical Activity Survey (YPAS). Physical performance was evaluated through observation using the Senior Fitness

Test (SFT). ADL performance was evaluated through The Activity Measure - Post Acute Care (AM-PAC), and depression was measured using the Geriatric Depression Scale (GDS).

*Intervention:* Subjects participated in one hour group sessions twice each week and were asked to complete a home exercise program independently once per week. FSAH was “manualized” to include personal goal setting, self-efficacy activities with a physical activity protocol that incorporated aerobic, strength, balance, and flexibility exercises in each session.

**Results/Limitations:** Significant results ( $p < .05$ ) and large effect sizes ( $r > .38$ ) were found for 6/6 SFT outcomes and 2/3 AM-PAC outcomes. No significance and a small effect size were noted for depression as per the GDS. The YPAS, administered at one month (T2) and two months (T3) post intervention as part of the

study design, revealed statistical significance for 3/8 measures at both T2 and T3. Effect sizes for eight YPAS indices ranged from very small to very large. Results reported on the YPAS may be subject to a Type II error as a power analysis conducted prior to initiation of the study using the YPAS to determine sample size revealed the need for a larger final sample ( $N = 27$ ) for a moderate effect at a power of 80%. Retention rate was 78.9%, and the adherence rate for group sessions was 89.7% for those who completed the study. No injuries or exacerbated conditions as a result of participation in this intervention were reported.

**Conclusion:** These results suggest that implementation of the FSAH in a low-income senior high rise may be well tolerated and may positively impact physical performance, physical activity, and ADL participation.

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## Opportunities for increased use of Thera-Band® products by occupational therapy professionals

Pamela E. Toto, MS, OTR/L, BCG, FAOTA

**Objective:** Identify opportunities for increased use of Thera-Band products by occupational therapy professionals as a strategy for increasing function in older adults.

**Background:** Despite training in the use of therapeutic exercise as a skilled intervention, frequency of use of exercise-related products by occupational therapy practitioners is widely variable. Therapeutic exercise is one of the most commonly billed skilled service by occupational therapy practitioners working with older adults and yet little is known about how these services are provided or the evidence-based rationale guiding each professional’s clinical judgment. To address this objective, the following hypotheses are being explored:

1. Occupational therapy practitioners do not use Thera-Band products because they do not see it as being “functional”.

2. Occupational therapy practitioners do not use Thera-Band products because they do not know how to adapt its use for exercise with special populations common to older adults.

3. Occupational therapy practitioners use Thera-Band products but do not choose exercises that will specifically support the client’s individual functional goals and outcomes (thus reducing the perceived effectiveness of the product).

**Study Design:** Pre/Post Survey and individual interviews.

**Methods:** Data collection will be gathered through a national online survey and 1:1 interviews of occupational therapy practitioners working with older adults. Participants will be asked to identify attitudes and barriers regarding use of exercise products and will be asked to identify types of products used, including frequency of use and progression. Based on feedback from these two sources, solutions will be prioritized in terms of importance and feasibility and resources will be created, publicized and distributed for OT clinical use. Satisfaction and product use will

then be measured using a survey and interviews at the 2011 AOTA Annual OT conference.

**Results:** Data from the survey (N=62) indicates 100% of respondents indicate exercise is at least sometimes an appropriate intervention in OT. Clinicians report frequent use (57%) of exercise as an intervention, and are most likely to incorporate exercise when working with clients in the community (69%) and during 1:1 visits (67%). The biggest reported barrier to using exercise products is disinterest by the client (63%). Exercise bands (80%) and therapy

putty (70%) are the most commonly used exercise products by OTs, and clinicians cite the need for protocols and products specific for the older adult with chronic health conditions (60%) as the primary resource to increase their use of exercise products. Individual interviews (N = 8) support these results.

**Conclusion:** Based on the preliminary results, resources to increase older adult interest in therapeutic exercise and resources to increase clinician comfort in product use for older adults with chronic conditions will be developed.

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## **The effect of different resistance training protocols on muscular strength, functional capacity and well-being in older adults**

### **Nadja Schott PhD**

Department of Sport and Exercise Science, University of Stuttgart, Germany

### **Introduction**

Age-associated losses of skeletal muscle mass and strength and increased fat mass are well documented, and are associated with important clinical outcomes such as mobility impairments, disability, falls, and fractures. Although it is well recognized that resistance training is an efficient strategy to enhance physical performance in older adults, less is known about the most effective type of resistive exercise or the role of functional training. This study compares the effectiveness of three varied short-term (12 weeks) training protocols on muscle strength, functional performance and well-being in older men and women.

### **Participants**

The participants will be healthy ambulatory community dwelling men and women over the age of 65 y.

### **Design / Methodology**

Participants who are deemed eligible to participate will be randomly allocated into one

of four groups. The allocation will be based upon an expected equal recruitment in the area of Stuttgart. There will be 3 randomly distributed interventions:

1. Machine training (MT) (12 weeks, 2d·wk<sup>-1</sup>)
2. Free weight training (FT) (12 weeks, 2d·wk<sup>-1</sup>)
3. Thera-Band® + Stability Trainer (TBST) (12 weeks, 2d·wk<sup>-1</sup>)
4. Control group

### **Study Intervention**

Exercise training – participants will perform supervised strength/resistance exercise two times a week for 12 weeks using a whole body exercise program that has been shown previously to be safe and effective.

### **Measurement**

The following measurements will be completed before (pre), and again at the end (+12 weeks) of the study:

- a) Functional capacity – stair climb, Timed-Up-and-Go-test, and chair stand test.
- b) postural control – force platform.
- d) Strength with weight training machines – peak strength in 6 muscle actions.

## **The Effects of a Closed-Chain, Eccentric Training Program on Hamstring Injuries of a Professional Football Cheerleading Team**

**Jay Greenstein**, DC, CCSP, CGFI-L1, CKTP\*; Bart Bishop, PT, DPT, CSCS, SCS, CGFI-L2, CKTP\*; Robert Topp, PhD ^

\*Sport and Spine Rehab Clinical Research Foundation, a 501-C3

^University of Louisville, Department of Nursing

**Purpose:** Estimates indicate that more than 1 million participants are involved in cheerleading at various levels.<sup>1</sup> The scientific literature reports that cheerleading injuries are injuries on the rise. Over 200,000 cheerleading participants between the ages of 5-18 were treated at hospitals emergency room departments between 1990-2002.<sup>2</sup> The majority of injuries were lower extremity (37.2%) and just over eighteen percent (18.4%) of the total injuries were soft tissue in nature.<sup>2</sup> Currently there is no peer-reviewed literature that exists on the epidemiology, risk factors and effective interventions for professional sports cheerleaders. This study is the second of a three-step process to identify the above.

**Methods:** Three injury surveys were given to 39 professional football cheerleaders that identified: Location of injury, Chronicity, Severity, Relationship of injury to cheerleading, and Epidemiological Variables

Surveys were given (1) when the team was selected; (2) at the beginning of football season; (3) at the end of the football season. Data was then entered into a database for analysis. Because hamstring injuries were the most prevalent injuries it was determined to perform the intervention in that group. The exercise intervention occurred directly after the pre-season survey was conducted. In-practice and home exercise instruction via the Thera-band® Band Loops were given to the injured and non-injured cheerleaders. These exercises included two closed chain, eccentric exercises using the

Thera-Band® Band Loops and were done 2 times weekly at practice 3 times weekly at home

### **Results:**

1. Pre-Season 1 (PS1) Survey Results: A total of 95 injuries were reported meaning that most cheerleaders had multiple injuries. Hamstring and low back injuries were reported most frequently with 17 girls suffering one, the other or both for each category.
2. Pre-season 2 (PS2) Survey Results: 16 cheerleaders reported hamstring injuries, 4 of whom did not have a hamstring injury at the time the team performed the PS1 survey. Only one cheerleader who reported having an injury during the PS1 survey reported no longer having a hamstring injury. The mean pain level of the symptomatic hamstring group was 6.07. 100% of the cheerleaders reported that the hamstring injury was directly related to cheerleading.
3. End of Season (ES) Survey Results: The mean pain level of the symptomatic hamstring group post intervention was 3.67, a reduction of 40%. Sixty-seven percent (67%) of the intervention group had a reduction in pain, which was determined to be statistically significant ( $p < 0.05$ ). Further, for that specific group pain levels were reduced by 63% going from a pre-intervention mean score of 6.3 to a post intervention score of 2.3. Lastly, between the PS1 survey and the PS2 survey 4 girls (10% of the team) reported new hamstring injuries. But, between the PS2 survey and the ES survey, only 1 girl reported a new injury, a reduction in new injuries by 75%. In addition, 4 different girls, who reported a hamstring injury in the PS1 survey, did not have the injury when

the PS2 survey was performed. They also did not report an injury at the ES survey.

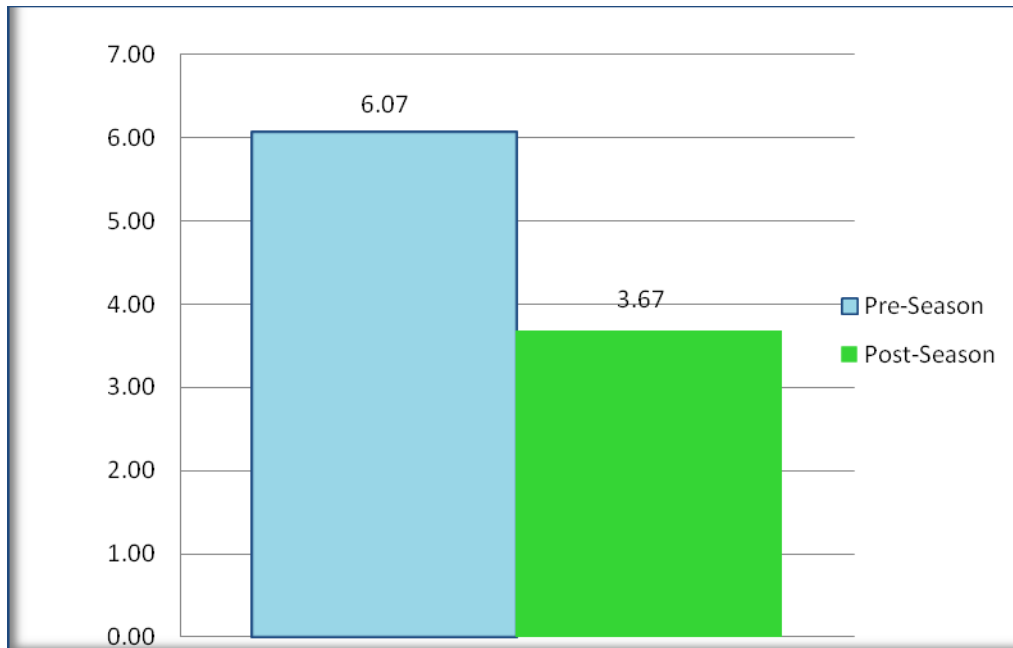
Further, PS1, 25.6% of the total team had a hamstring injury, at PS2, that number rose to 34.9% and at ES, the time when the intervention at PS2 began and the end of the season, there was no increase and 34.9% still reported having some, albeit decreased pain. It was further determined based on the analysis that there was no effect of time and external hamstring treatment on the outcome. Lastly, home exercise compliance was evaluated and the cheerleaders that did their exercise one additional time or more at home had a statistically significant decrease in pain that the non-compliant cheerleaders did not have ( $p < 0.05$ ).

**Conclusion:** Closed chain eccentric exercises with the Thera-Band® Band Loop had a significant reduction in hamstring

injury pain levels in the professional cheerleading population. Further, this particular protocol seemed to have a preventative effect on new hamstring injuries in this specific population. Future work will focus on three different exercise protocols using the Thera-Band® loop, stability disc and Thera-Band® Tubing Loops with Cuffs in evaluating the treatment and prevention of hamstring injuries in the professional cheerleading population.

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## The Results of Combining Kinesio® Tape and Biofreeze® Versus Kinesio® Tape and Biofreeze® Alone on Spinal Pain: A Randomized Controlled Trial

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**Background:** Both Kinesio® Tape and Biofreeze® are widely used in the rehabilitation of various musculoskeletal conditions. The purpose of this study was to determine if there is a benefit of using Kinesio® Tape or Biofreeze® combined with Funhab® (functional rehabilitation) is superior to Funhab® alone and if Biofreeze® has an amplification effect on the Kinesio® Tape application.

**Methods:** One hundred and twenty patients presenting to an out-patient clinic with diagnoses of lower back pain and/or neck pain were randomized into four groups. Group 1 (FH) received Funhab® alone and included 28 subjects. Group 2 (KT) received Funhab® plus Kinesio® Tape and had 42 patients. There were 22 patients in Group 3 (KTBF) which were given Funhab® plus Kinesio® Tape plus Biofreeze®. Finally, Group 4 (BF) was given Funhab® and Biofreeze® and contained 28 subjects. The subjects rated their symptoms on the Numeric Pain Rating Scale (NPRS), and they filled out either an Oswestry or an NDI depending on their condition. The practitioner determined which method of Kinesio® Tape (facilitative or inhibitory) to use based on the answer the following question: Do you have tightness or pain in a muscle which is contributing to your chief complaint today? If yes, then an inhibitory technique was used to inhibit the spasm and tightness of the muscle(s). If no, then a facilitative technique was used based on a weakness as shown by repeated manual muscle testing or poor performance on therapeutic

exercise. The Biofreeze® spray was sprayed 5-6 times in the region of pain. The data was analyzed for the entire group as well as per condition.

**Results:** The results were varied based on condition. For all patients and NPRS, FH, KT, and KTBF had statistically significant reductions in pain ( $p=0.00$ ) with BF not having a statically significant reduction in symptoms (Table 1). For the NDI, KT and BF had a statistically significant reduction in disability ( $p=0.00$ ) with FH and KTBF not changing significantly (Table 2). With regard to the lower back pain groups and Oswestry findings, only BF had a significant reduction in disability ( $p=0.00$ ) and it was significantly lower at the end of the treatment than FH ( $p=0.029$ ) (Table 3). There were clinically significant changes in all groups for all regions of complaint (Tables 1-3).

**Conclusions:** The results of the study were varied depending on condition and Group, but the analyses show that Biofreeze® is indicated for the treatment of lower back pain and neck pain and Kinesio® Taping method is indicated for the treatment of neck pain. It does not appear that the treatments should be combined as there isn't an amplification effect of treatment by combining the Kinesio® Tape and Biofreeze®.

**Future Considerations:** Based on the varied results, more research needs to be done to determine if there are covariates that affected the outcomes and why there was not an amplification of treatment by adding Biofreeze® to the Kinesio® Tape. In addition, some logical questions to answer are if there is over stimulation of the region by adding KT and Biofreeze® in one region and to see if patients feel that they were worse off because they received so more treatments in their area of chief complaint.

**Table 1 – NPRS**

Group	time	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	1	7.036	.319	6.404	7.667
	2	1.911	.385	1.147	2.674
2	1	6.286	.260	5.770	6.801
	2	1.702	.315	1.079	2.326
3	1	6.227	.360	5.515	6.940
	2	2.545	.435	1.684	3.407
4	1	5.429	.319	4.797	6.060
	2	1.857	.385	1.094	2.620

**Table 2 – NDI**

Group	time	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	1	34.222	5.231	23.641	44.803
	2	19.111	4.590	9.827	28.395
2	1	38.909	4.732	29.338	48.480
	2	18.182	4.152	9.784	26.580
3	1	27.600	4.963	17.562	37.638
	2	13.000	4.354	4.192	21.808
4	1	38.000	4.353	29.196	46.804
	2	19.231	3.819	11.506	26.956

**Table 3 – Oswestry**

Group	time	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	1	40.700	2.622	35.442	45.958
	2	26.100	3.057	19.968	32.232
2	1	34.167	2.763	28.624	39.709
	2	18.000	3.222	11.537	24.463
3	1	34.500	4.145	26.186	42.814
	2	16.250	4.834	6.555	25.945
4	1	30.545	3.535	23.455	37.636
	2	13.091	4.122	4.823	21.359

## **Effects of a short-term resistance program on strength in fit young women using weight machines/free weights or elastic bands**

**Juan Colado PhD**

The aim of this study was to assess effects of a short-term resistance program on strength in fit young women using weight machines/free weights or elastic tubing. Forty-two fit women ( $21.79 \pm 0.7$  years) were randomly assigned to the following groups: (i) the Thera-Band® Exercise Station Group (TBG); (ii) the weight machines/free weights group (MFWG); or (iii) the control group (CG). Each experimental group performed the same periodised training program that lasted for 8 weeks, with 2-4 sessions per week and 3-4 sets of 8-15 reps. submaximals. A load cell (Isocontrol; ATEmicro, Madrid, Spain) was used to test the evolution of the maximum isometric voluntary contraction (MIVC) in three different exercises: vertical rowing (VR), squat (S) and back extension (BE). A mixed model MANOVA [group (CG, TBG, MFWG) x testing time (pre-test, post-test)] was applied to determine the effect of the different resistance training devices on strength. The only groups that improve ( $p < 0.005$ ) their MIVC were TBG and MFWG, respectively: VR 19.87% and 19.76%; S 14.07 and 28.88; BE 14.41% and 14.00%. These results indicate that resistance training using elastic tubing or weight machines/free weights have equivalent improvements in isometric force in short-term programs applied in fit young women.

## **Randomized Clinical Trials Assessing the Clinical Efficacy of Rehabilitative Exercise and Manipulation in Adolescent and Senior Populations**

**Bronfort G, Evans R.**

**Purpose/Background:** Back pain is common across the entire age continuum affecting adolescents and seniors alike. As health care costs continue to soar, the search for effective treatments with few side effects is critical. The best care will not only aim at treating back pain specifically, but will also encourage an active lifestyle. Spinal manipulation and exercise are two such therapies. While they have shown promise in non-senior adult populations, there has been little high quality research investigating these treatments for adolescent and senior back pain sufferers.

Our group is currently conducting two observer-blinded randomized clinical trials investigating chiropractic care (with manipulation) and exercise for adolescent and senior back pain sufferers.

**Methods:** The first study will involve a total of 184 participants 12-18 years of age, with back pain. All patients receive instruction in rehabilitative exercises. Focus is placed on enhancing mobility, neuromuscular control, and trunk endurance using low-tech exercise methods including use of labile surfaces (Thera-Band® Exercise Ball).

In the second study, a total of 300 elderly, community dwelling individuals with chronic back problems will be recruited. All patients receive a program of low tech exercises aimed at increasing endurance strength of the

supporting spinal musculature, enhancing spinal mobility, and facilitating neuromuscular control and balance. Resistance tubing and stability trainers (Thera-Band®) will be used to perform the exercises.

In both studies, one group will receive chiropractic care in addition to the exercise program which includes spinal manipulation and mobilization. The number and frequency of treatments are determined by the individual chiropractor, based on patient-rated symptoms, disability, palpation, and pain provocation tests.

Self-reported outcome measures (pain, disability) will be collected by questionnaires at baseline and specified time points post-randomization; objective biomechanical measures will be assessed by examiners blinded to group assignment. Qualitative interviews will be conducted to describe patients' perceptions and experiences with treatment.

**Data analysis:** The primary analyses for both studies will use Analysis of Covariance (ANCOVA) to test for between-group differences in pain and disability scores.

**Results:** None available at this time. Recruitment began in February/March 2010. Upon completion, these studies will provide some of the first, high quality evidence regarding the effectiveness of low-tech exercise with and without chiropractic care, for adolescents and seniors with back problems.

**Project Period:** 9/01/09 – 8/31/12

**Funding:** US Health Resources and Services Administration

## **Massage therapy, functional taping and topical analgesics: a combined therapeutic approach to improving chronic low back pain; a feasibility survey.**

Diana L. Thompson, LMP

**Purpose/Background:** According to the 2007 National Institutes of Health (NIH) survey on complementary and alternative medicine (CAM) use in the U.S., massage therapy was identified as the number one practitioner-based CAM expense for consumers (second overall behind product sales). In the same survey, low back pain was identified as the number one reason people seek CAM care. The introduction of a workshop training massage therapists to add functional taping and topical analgesics to their massage therapy sessions, “Elevate Your Practice Using Kinesio Tex Tape, Biofreeze®, Prossage®, and Massage”, presented a unique opportunity to survey a wide range of patients and practitioners on the feasibility and potential success of a combined therapeutic approach to treating a common health condition for Americans: chronic low back pain. Massage therapy is a recognized treatment option for low back pain. Massage therapists incorporate a variety of additional therapies within their scope of practice to massage sessions but without evidence of their added value. This survey may inform future research of the need for study of combined methods within the scope of massage practice.

**Methods:** Two workshop presenters—licensed massage therapists and certified Kinesio Taping instructors trained in the use of PHI products—trained 730 licensed or certified massage therapists in the application of combining massage therapy, topical analgesics (specifically Prossage/Biofreeze), and functional taping (specifically Kinesio Tex Tape) (M/TA/FT) for low back pain and other musculoskeletal conditions between January and May 2010. Workshop

attendees were invited to participate in the feasibility survey and those interested received survey packets. Workshop presenters provided a brief training on the survey, explained the inclusion/exclusion criteria, and reviewed the low back protocol to ensure its proper application. Participating massage therapists invited patients from their practice who currently experience low back pain to participate in the survey.

**Data Analysis:** 300 survey packets were distributed during the 12 one-day workshops. Patients and practitioners were instructed to complete separate forms rating their perceived success of treatment and satisfaction with the protocol. Sixty-three surveys were returned, five did not include a practitioner survey. Two patients did not meet the inclusion criteria and their surveys were not included in the data. In total, 61 patient surveys and 58 practitioner surveys are reflected in the data.

**Results:** Patients were asked to rate their low back pain and movement limitations on a scale of 0-10 before and after the protocol was administered. Pre-pain ranged from 3-10 of 10 and averaged 5.7. Post-pain ranged from 0-8 of 10 and averaged 2.6, with an average change of 3.1. Pre-movement limitations ranged from 2-8 of 10 and averaged 4.9. Post-movement limitations ranged from 0-8 of 10 and averaged 2.5, with an average change of 2.4. Both patients and practitioners felt the additional therapies were sensible additions to a massage session (patients: 93%, practitioners: 95%). Patients felt the combination of treatments reduced pain and improved movement, attributing the reduction in pain to M (92%), TA (66%), and FT (72%), and the improvement in movement to M (89%), TA (57%), and FT (67%). Practitioners commented on the likelihood of adding TA (90%) and FT (95%) to future massage sessions.

**Conclusion:** Satisfaction with the combination of M/TA/FT for back pain was very high.

## **Muscle activation and perceived loading during rehabilitation exercises: comparison of dumbbells and elastic resistance.**

**Andersen** LL, Andersen C, Mortensen OS, Poulsen OM, Bjornlund IBT, Zebis MK.

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**Background:** High-intensity resistance training plays an essential role in the prevention and rehabilitation of musculoskeletal injuries and disorders. Although resistance exercises with heavy weights yields high levels of muscle activation, the efficacy of more user-friendly forms of exercise needs to be examined. The aim of the present study is to investigate muscle activation and perceived loading during upper extremity resistance exercises with dumbbells compared with elastic tubing.

**Subjects:** Sixteen female workers (26 to 55 years) without serious musculoskeletal diseases and a mean neck/shoulder pain intensity of 7.8 on a 100 mm VAS scale.

**Methods:** Electromyography (EMG) was measured in five selected muscles during the exercises lateral raise, wrist extension, and

shoulder external rotation during graded loadings with dumbbells (2 to 7½ kg) and elastic tubing (Thera-Band®, red to silver resistance). The order of exercises and loadings was randomized for each individual. EMG amplitude was normalized to the maximum-maximorum EMG. Immediately after each set of exercise the Borg CR10 scale was used to rate perceived loading during the exercise.

**Results:** Resistance exercise with dumbbells as well as elastic tubing showed increasing EMG amplitude and perceived loading with increasing resistance. At the individually maximal level of resistance for each exercise – defined as the 3 repetitions maximum –, normalized EMG of the prime muscles was not significantly different between dumbbells (59-87%) and elastic tubing (64-86%). Perceived loading was moderately to very strongly related to normalized EMG ( $r=0.59-0.92$ ).

**Conclusion:** Comparable high levels of muscle activation were obtained during resistance exercises with dumbbells and elastic tubing, indicating that therapists can choose either type in clinical practice. The Borg CR10 can be a useful aid in estimating intensity of individual rehabilitation protocols.

## **Instability resistance training for health, performance and rehabilitation**

**David Behm, PhD**

Training of the trunk or core muscles for enhanced health, rehabilitation and athletic performance has received renewed emphasis. Instability resistance exercises have become a popular means of training the core and improving balance. Whether instability resistance training is as, more, or less effective than traditional ground based resistance training is not fully resolved. Core and limb muscle activation are reported to be higher with similar exercises performed under unstable versus stable conditions. While unstable devices have been shown to be effective in decreasing the incidence of low back pain and increasing the sensory efficiency of soft tissues, they are not recommended as the primary exercises for hypertrophy, absolute strength, or power since unstable bases can result in decreased force, power, velocity and range of motion. Training programs must prepare athletes for a wide variety of postures and external forces and should include exercises with a destabilizing component. For athletes, ground based free weight exercises with moderate levels of instability should form the foundation of exercises to train the core musculature. Instability resistance exercises can play an important role in athletic program periodization, rehabilitation and as alternative exercises for the recreationally active and health conscious individual with less interest or access to ground based free weight exercises.

***Independent Research Projects Supported by Thera-Band Academy***

<b>Institution</b>	<b>Title</b>
<b>University Of Ulster, Jordanstown IRELAND</b>	Effects of exercise and supplementation intervention on physical functioning and IGF-1 levels in elderly hip fracture patients
<b>Technical University Munich GERMANY</b>	The prospective investigation of a newly combined deficit-compensating training program for the prevention of shoulder disorders in overhead-throwing athletes.
<b>Erasmus Medical Center, Rotterdam HOLLAND</b>	Interactive exercise therapy at home for Diabetes
<b>McMaster University Medical Center CANADA</b>	A one-year randomized open-label study examining the efficacy of resistance training in combination with enzyme replacement therapy in adult-onset Pompe disease patients
<b>MD Anderson Cancer Center</b>	Concurrent versus sequential smoking and physical activity intervention for cancer survivors
<b>MD Anderson Cancer Center</b>	Telephone Counseling-Mailed Materials vs. Internet Weight Management Interventions in Overweight Cancer Survivors
<b>Regis University</b>	The Effects of Resistance and/or Cardiovascular Training on Strength, Cardiovascular Status, Function, EMG Activity, Psychosocial, and Physical Activity Parameters in Community-Dwelling Older Adults
<b>Universiti Kebangsaan MALAYSIA</b>	Evaluation of exercise and nutrition intervention among elderly with sarcopenia
<b>University of South Carolina</b>	Evaluation of a Self-Directed, Packaged Physical Activity Program for Adults with Arthritis
<b>University of Wisconsin Oshkosh</b>	The Effects of Thera-band® and Ankle Isolator® Strengthening on Dynamic Balance
<b>U Central Florida</b>	Development of a Clinical Prediction Rule to Identify Patients with Neck Pain Likely to Benefit from Education and Exercise
<b>Capio Arthro Clinic, Stockholm SWEDEN</b>	Eccentric Exercise Program for Tennis Elbow
<b>University of Wuppertal, GERMANY</b>	Haemophilia in Motion
<b>National Research Centre for the Working Environment, Copenhagen DENMARK</b>	Neck/shoulder rehabilitation with elastic resistance exercise: How little is enough?
<b>University of Warwick, UK</b>	SARAH: Strengthening & Stretching for Rheumatoid Arthritis of the Hand
<b>Technical University in Lisbon PORTUGAL</b>	Effects of an exercise program in the physical condition of individuals submitted to hepatic transplant by Familial Amyloidotic Polyneuropathy
<b>Regis University</b>	The Use of Thera-band® to Determine 1RM in Community Dwelling Older Adults
<b>Ruhr-University Bochum, Department of Sports Medicine and Sports</b>	Feasibility of a general practitioner based exercise program in a community-dwelling cohort of people aged >70 years with

<b>Nutrition</b>	multiple chronic diseases.
<b>Occupational Therapy School &amp; Centre, Seth G.S.M.C &amp; K.E.M.H, parel, Mumbai, INDIA.</b>	The effects of isometric elastic resistance exercise in subjects with chronic neck pain
<b>Ghent University, BELGIUM</b>	Improving patient adherence to lifestyle advice in leg ulcer patients
<b>Acadia University, Nova Scotia, CANADA</b>	Impacting physical activity and exercise in individuals with type 2 diabetes in Nova Scotia: Implementation and evaluation of the "Physical Activity & Exercise Tool-kit"
<b>University of Kentucky</b>	Efficacy of Home-Based Kinesthesia, Balance & Agility Exercise Training Among Persons with Symptomatic Knee Osteoarthritis
<b>Boston University Health and Disability Research Institute</b>	Efficacy of a Post Rehabilitation Intervention in Patients after Hip Fracture
<b>Armstrong Atlantic</b>	Optimal Home Exercise Program Frequency in Subjects Being Discharged from a Physical Therapy Program for Subacromial Impingement
<b>Virginia Commonwealth University</b>	Effectiveness of Rehabilitation for Subacromial Impingement Syndrome
<b>Wichita State University</b>	Efficacy of Adding a Weekly Class to an Internet-Based Physical Activity Program for Older Adults
<b>Lutheran University of BRAZIL</b>	Influence of Thera-Band® equipment on indicators of worker's health: A electromyographic comparison
<b>Univ of Rochester</b>	The influence of Home-Based Aerobic and Resistance Exercise on Cancer-Related Fatigue, Strength, and Muscle Mass in Prostate Patients during Radiotherapy
<b>Boise State University</b>	Fit and fall proof: An exercise program for older adults
<b>Central Hospital of Central FINLAND</b>	Resistance training in treatment of postoperative shoulder pain and weakness
<b>University of LITHUANIA</b>	Efficacy of Kinesthesia, Balance and Agility Exercise Training Treatment for Knee Osteoarthritis: A Pilot Study
<b>McMaster University, Hamilton, Ontario CANADA</b>	Transition from exercise-based outpatient cardiac rehabilitation: Examination of adherence, psychosocial and functional outcomes relative to participant independence
<b>Univ of Georgia</b>	The use of resistance-training to target physiological change in older women with osteoarthritis
<b>University of Nebraska Medical Center</b>	Modifying Lifestyle in Prehypertensive Older Rural Women
<b>Hannover Medical School, GERMANY</b>	Epicondylitis radii - Effect of physio-therapy and/or external bracing on grip power and elbow microcirculation
<b>University of Nevada, Reno</b>	Measurements of outcomes of a medically-based weight-lost program integrating FSAH