original article

Effect of a Comprehensive Loop System on Whole body Exercises Using Elastic Bands

M.Vijayakumar[1], Purnima Surve[2], Tushar Palekar[3], Ravi Patel[4], Halisha Shah[5]

[1]Associate Professor, [2]Post Graduate Resident, [3]Principal, [4]Post Graduate Resident, [5]Post Graduate Resident, Dr. D.Y. Patil College of Physiotherapy, Dr. D.Y.Patil Vidyapeeth, Pune, India

Abstract

Background:- Strength is the capability of the neuromuscular system to produce force against an external resistance.[1] Muscular performance is regarded as one the significant component in quality of life. Strength training helps to increase the muscular tension which eventually increases the muscular performance.[2] The repeated and consistent resistance training strengthens the muscles.[3] Most of the studies shows the effect of elastic resistance training with short term interventions on muscle strength(isotonic elastic resistance training) and have shown positive outcomes[4]. This is the first study investigating on increase in the strength of concentric, eccentric , as well as isometric muscle contraction and also, as a whole body exerciser with targeted muscle and group muscle training. In this study we lack the knowledge on how elastic resistance training affects the muscle strength in upper and lower body. Therefore, it is important to know if this comprehensive loop system, as a special training variable, could improve the strength in adult healthy individuals. This study will help to determine the effect of comprehensive loop system on whole body exerciser using elastic bands, and assess if four weeks of training are sufficient to change upper and lower limb strength.

Methodology:- Total 30 subjects were included in the study. All the subjects are healthy individuals were included from orthopedic departments, physiotherapy OPD, physiotherapy clinics, sports academy. Demonstration of the test with help of video and test trial was given in order to gain confidence and break their fear. Latin square design chit was made and participants were asked to randomly pick up the chits. Subjects has to follow the same order of the test from in order to avoid learning bias. They were assessed for push-up test and squat test for strength before and after the training. And a four weeks training protocol was taken to assess the upper and lower limb strength respectively.

Result:- There is a positive increase in the strength of the muscle which was checked using the push-up and squat test for upper limb and lower limb respectively. With increase in the counts of push-up test (o.ooo) pre and post training session and with the squat training ($p>0.05$) pre and post training session, there is a subsequent positive increase in the strength gain of an healthy individual.

Conclusion:- There is significant change in the muscle strength after four week of elastic training protocol of healthy adult individuals. Therefore, the tool kit is helpful as a whole body exerciser as well as a specific targeted muscle exerciser to increase a individual muscle strength and to improve the way of exercising without any hindrance in the aspects of space and heavy machine.

Keywords:- *Resistance tubes, strength training, whole body exercise, squats, pushups.*

Introduction

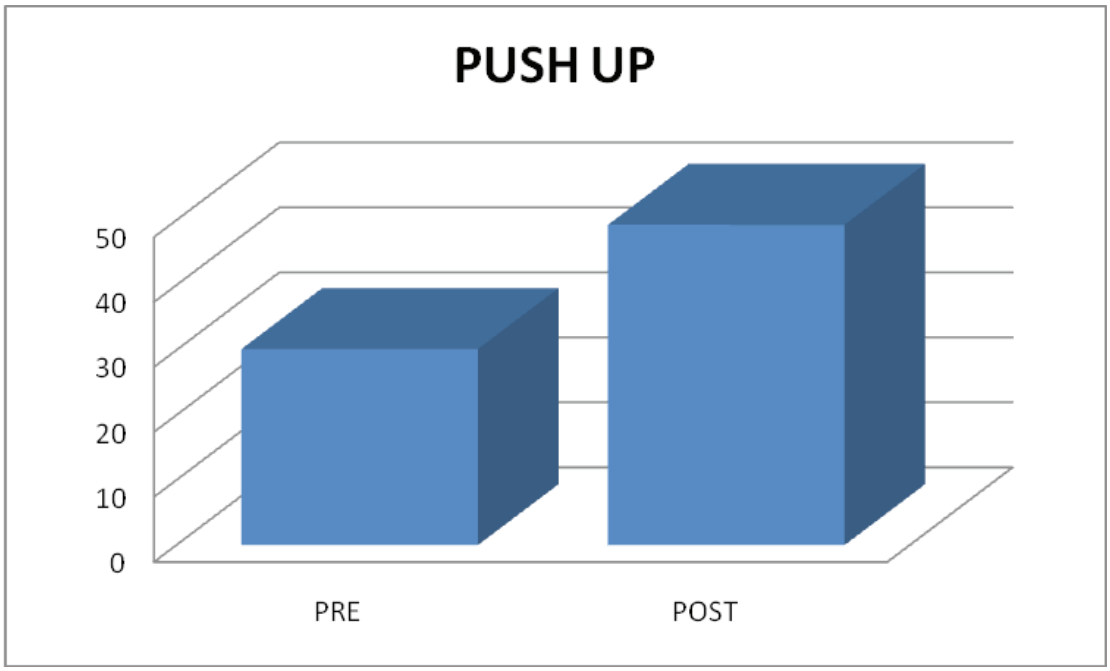
Strength is the capability of the neuromuscular system to produce force against an external resistance.[1] It is the ability to create muscle tension. Muscular performance is regarded as one the significant component in quality of life[1]. Strength training helps to increase the muscular tension which eventually increases the

muscular performance.[2] Resistance training is the use of resistance of muscular contraction to build the strength, anaerobic endurance and size of skeletal muscles.[2] It is the principle that muscles of the body will work to overcome a resistance force when they are required to do so.[3] The repeated and consistent resistance training strengthens the muscles.[3] Strength training is important to improve functional activity to increase strength and performance. By stressing your bones, strength training increases bone density and reduce the risk of osteoporosis.[4] A well- rounded fitness program includes strength training to improve bone, joint function, bone density, muscle, tendon and ligament strength, as well as aerobic exercise to improve your heart and lung fitness, flexibility and balance exercises.[5] The full-body workout can help you progress and is easy to fit into your schedule. Among, the other factors, muscular strength is considered as the most significant component which is reduced by aging.[6] Decreased muscular strength can bring about various problems and complications such as increased risk of chronic diseases, intensified risk of fall, lack of dependence and ultimately, reduced quality of life.[7] The performance of an athlete is affected severely with various other complications. Reduced strength also accounts for muscle weakness, reduced muscle mass and decreased resistance exerted by the body hampering various aspects of the training program and reducing capacity of the body.[8]

Methods

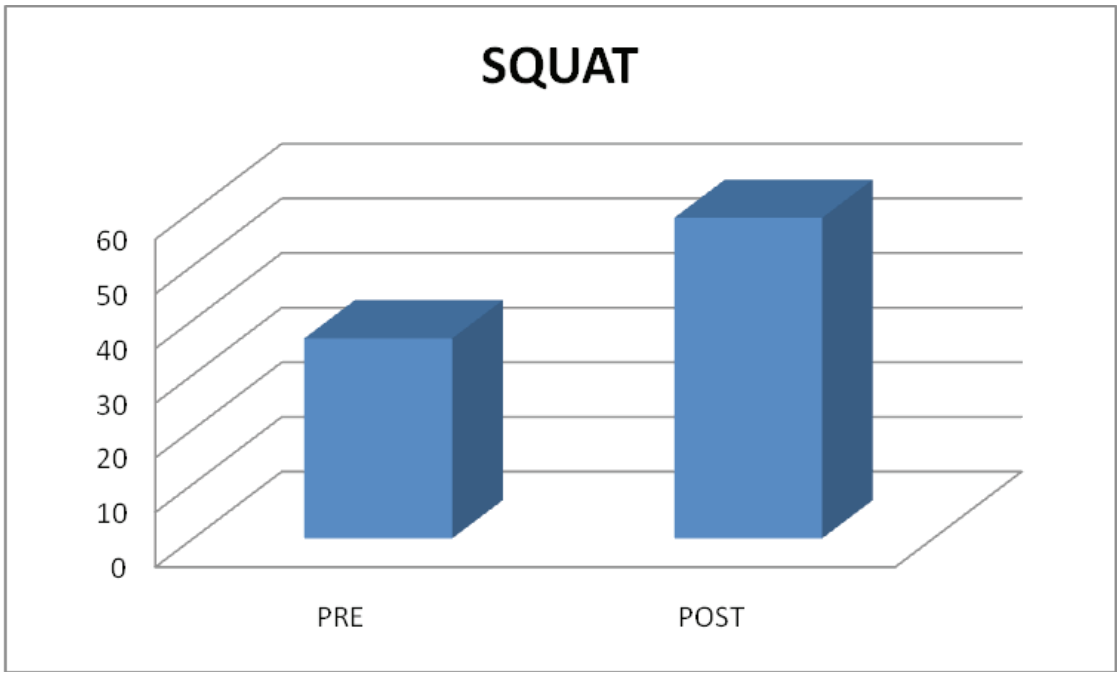
30 participants as healthy individuals are included in the study with inclusion criteria as Amateur sportsmen/Healthy individuals with no musculoskeletal /neurological/cardiovascular impairments. To avoid performance bias as it is a new instrument and studies are not performed on such instrument before and after the phase one of the too exercise. A four week protocol was followed where in the upper limb and lower limb exercises with resistance bands are performed. Training sessions of 4 days per week were given for four weeks. This training was carried out at DR. D.Y.Patil college of Physiotherapy.

Data Analysis and Interpretation:



Graph no. 1: Pre and post push up test data analysis.

Interpretation: According to the graph no.1 there was a significant increase with the count of push up was seen after the protocol regimen. This suggests that the exercise regimen with resistance helps in increasing the strength of an individual.



Graph no.2: Pre and post squat test data analysis.

Interpretation: According to the graph no. 2 a significant increase in the count of squats were recorded pre and post. This suggests that the exercise protocol for squat with resistance tube had a positive impact and increased the strength for lower extremities.

Results

In this study, 30 healthy individuals were taken. The study suggest a significant increase in the pre and post values of the push up and the squat test. The mean value of the push up test recorded (29.87). and the mean difference recorded was 18.93 and the t-value for the pushup test -16.85 with a significant p value ($p>0.05$). Similarly for the squat test the mean calculated was 58.37 with a standard deviation of 8.66 shows a significant increase in the squat recording pre and post of the training sessions with a p value significant as (>0.05) and concluded with an increase in the muscular strength. By applying wilcoxin signed rank test the comparison of pre and post training session was made and a significant increase in the strength gains was seen.

Discussion

The present study was done to determine the effectiveness of the loop system as a whole body exerciser using elastic bands. Resistance exercise using elastic bands has been used as an important intervention for increase in the strength of upper limb and lower limb respectively. The findings of our study is in accordance with positive effects on muscular strength gain from the use of elastic tubes.

A study was conducted on effect of short term elastic resistance training on muscle mass and strength in older adults with push-ups by Ricardo Jaco et.al did not found any significant increase in the mass and the strength whereas our study showed an increase in the muscular strength which was tested by push-ups test and a significant gain and strength of the muscles can be seen after a four weeks protocol regimen.[9]The findings for the push-up by calatyud et.al who reported that push-ups performed with resistance band exercise were equally effective to bench press in activating the prime-movers however, as push-ups is a relatively heavy body weight exercise, the comparsion component accounts for a smaller change than In our study which could explain that the strength using the loop system has effectively increased and has shown an improvement in the strenghth of an individual with solely using the resistance tubes.[10] These study results were similar to a study conducted by Micheal R. Guigan et.al on effect of elastic bands on force and power characteristics during back squats exercise which stated a significant increase

in the force and power of the muscle gained, as compared to this study shows the increasing strength of the muscle while performing the squats.[11]

However, the elastic tubes helpful in resistance training (the kit) is more easily available and affordable exercise kit for the adult population. Also this tool is practically low cost and travel-friendly.[12] No interuuption in the exercise protocol can be seen due to its versatile features. One of its most versatile characteristic is the portability that allows training programs in outdoor situations.[13] In additon, overload training stimulus could be self-regulated by the use of the colour-code (elastic tubes with different dimensions and forces) and corresponding to target muscle training protocol.[14]

This study on whole body exerciser using elastic bands found that the strength and the potential of an individual increased during the training sessions. Also the functional capacity is said to be improved with the resistance training. The device is useful in strengthening the muscle group as a whole or a targeted muscle as and when required by the individual.

Conclusion

This research study concluded that that there is significant change in the muscle strength after four week of elastic training protocol of healthy adult individuals. Therefore, the tool kit is helpful as a whole body exerciser as well as a specific targeted muscle exerciser to increase an individual muscle strength and to improve the way of exercising without any hindrance in the aspects of space and heavy machine. As a training modality, the relationship between the increase in the push-up and squats with regards to the upper limb and lower limb increasing strength. Nevertheless, it has also shown a positive result with increased strength for the same.

Acknowledgement : I would like to thank authorities of DR. D.Y .PATIL Vidyapeeth for allowing me to conduct this study by providing infrastructure and equipment. I would also like to thank all the participants of the study.

Conflict of Interest: There was no conflict of interest in this study.

Source of Funding – Self

Ethical Clearance- Done

References

1) Chodzko-Zajko WJ,proctor DN, fiatarone singh MA, Minson CT, Nigg CR, Salem GJ, et.al American College of Sports Medicine position stand. Exercise and physical activities for adults. Med Sci Sports Exercise. 2009;41(7):1510-40.

2) Macaluso A, De Vito G.et.al Muscle Strength, power and adaptations to resistance training in individuals. Eur J Appl Physiol. 2004;91(4):450-72

3) Holviala JH, Sallinen JM, Kraemer WJ, Alen MJ, Hakkinen KK. Effects of strength training on muscle strength, characteristics, functional capabilities, and balance in adults. J strenghth Cond Res. 2006;20(2):336-55.

4) Peterson MD,Rhea MR, Sen A, Gordon PM. Resistance exercise for muscular strength in older adults: a meta-analysis. Med Sci Sports Exercise. 2011;43(2):249-58.

5) Hostler D, Schwirian CI, Campos G,Toma K,Hagerman GR, et.al. Skeletal muscle adaptations in elastic resistance trained young men and women. Eur J Appl Physiol. 2001;86(2):112-28.

6) Colado JC, Garcia-Masso X, Pellicer M,et.al. A comparison of elastic tubing and isotonic resistance exercises. Int J Sports Med. 2010;31(11):801-7

7) Song WJ, Sohng KY. Effects of progressive resistance training on body composition, physical fitness and quality of life of individuals.2012;42(7):947-56.

8) Gregory d, mark petarno. Et.al. Sports resistance training with elastic bands in rehabilitation sport phase. Journal of orthopedic and sports physical therapy.2006;36:385-397.

9) Martins WR, de Oliveira RJ, CArvalho RS, da Siolva MS. Elasric resistance training to increase muscle strength in elderly: a systematic review with meta-analysis. Arch Gerontol Geriatr. 2013;57(1):8-15.

10) Kraemer WJ, Fleck SJ, Evans WJ. Strength and power training. Physiological mechanisms of adaptation. Exerc Sport Sci Rev.1996;24:363-97

11) ChristopherJ Kotarsky et.al. Effect of progressive pushups training on muscle strength and mass. Journal of physical therapy.2014;87(3) :337-349.

12) Brent brotzman, Robert et al. clinical orthopedic rehabilitation an evidence based approach. elsevier.2011;3rd edition:220-245.

13) Alexander, Anderson.et al.Resistance Training in Essentials strength and conditioning.46(5):69-74 Journal of sports surgery.2006;

14) Adam Bryant et al. Performance on the Single-Leg Squat with resistance training with elastic bands. The American Journal of Sports Medicine.2011;39(4);866-879.

15) Suniek, rikknen, vasrroo et al. A comparison of static and dynamic resistance with unilateral and bilateral total squat training with resistance bands.2009;20:93-101

16) Ali gokeler, anne, et al. proprioceptive deficits after ACL injury: are they cilically relevant?. Journal of sports medicine.2012;46:180-192.

17) Youneshachana, helmichaabene, Mohamed A et al. test retest reliability, cretirion – related validity, and minimal detectable chance of the Illinois agility test in male team sports athlete. journal of strength and conditioning research.2013;27:2752-2758

18) Michael j et al. Rehabilitative Techniques for push ups with elastic tubing Mayo Clinic.1990; 65:1322-1329.

19) David grinde m, Andrew lynch, et al. comparison of push-ups and squats with resistance training using elastic bands. American journal of sports medicine,2012;40:2348-2356.

20) David Hostler,Chris J.Skeletal adaptation in elastic resistance. Journal of musculoskeletal disorder.2017;(18):299.

21) Ronald thomee, jonkarlsson et al. The squat exercise for increasing strength . 2004;12:350-356.

22) Michal p, Ronald s, et al. Combining elastic resistance with weights a comparative study. The orthopedic journal of sports medicine.2015;3(3):1-8.

23) Cooper , N. F. Taylor et al. A Systematic Review of the Effect Of Upper limb and lower limb exercise training with elastic tubing and strength conditioning . Journal of Research in Sports Medicine.2005;13: 163–178.

24) LAURA C, MARK V et al.The Impact of Strength on Functional Performance at resistance based exercise regimen.Journal of Orthopedic Sports Physical Therapy.2012;42:750-759.

25) Timothy E, Stephanie L et al. Current Concepts for Injury Prevention in resistance training with weights and bands . American Journal of Sports Medicine. 2013; 41(1): 216–224.

26) Sue D, westin, KP, Shupu.B,Bpur. Resistance training with upper and lower limb specific training.2017;24(005):9494-4499.

27) Francisco et al. Factors affecting the strength training with upper limb and lower limb with resistance training. Journal of Sports and medicine 2006;33(2):354-377.

28) Calatayud,J. Colado,J.C,Martin.F, Tella. Bench press and push-ups at comparable levels of muscle activity results in strength gains. Journal of strength and conditioning research,29(1),247-259.

29) Jokobsen,M.D, Anderson, C.H,Zebis,M.S.K. Muscle activity during squats and push-ups strengthening exercise performed in training with elastic resistance. American Journal of Physical Medicine and Rehabilitation,93;2010;(9)409-430.

30) Ratames,N.A,Lehman.G.J.et.al Fundamentals of resistance training: Progression and exercise prescription. Medicine and Science in Sports and Exercise. 2011;36(4):674-688.