

Health Study: Effect of
Traditional (Static) Vs. Dynamic
Warm-up on Muscle Power



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Quarterly Published Physiotherapy Newsletter

The news letter from students and faculties of School of Physiotherapy, RK University, Rajkot

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Health Study

Effect of Traditional (Static) Vs. Dynamic Warm-up on Muscle Power

Introduction: In recent sport science, different warm up protocols are one of the debated topics to improve the performance. According to Daniel (2005, p.453), high intensity squats increases performance of vertical jumps. This shows controversy with traditional warm-up. Here, the question is that either traditional (static) warm-up or dynamic warm-up

protocols effectively improves the performance. Pearce et al. reported that static stretching reduces performance where as dynamic stretching improves the performance.

Subject: Motor Control and Skill in Exercise [AHH5012]
Submitted to: Dr. Alan Pearce & Mr. Luke Griepelis
Submitted by: Kaivalyakumar Jani
Exercise Science. Victoria University, Australia

Protocol for Static (Traditional) Group:

- Completed 12 laps (up and back) jogging (up to 60% VO₂ max) in the corridor.
- Heart Rate (carotid artery) was taken and recorded.
- Performed 1st non-counter movement jump on the force platform and recorded vertical jump height.
- Performed calf stretch (2 x 30 sec holds, both legs).
- Performed hamstring stretch (2 x 30 sec holds, both legs).
- Performed quadriceps stretch (2 x 30 sec holds, both legs).
- Performed gluteal stretch (2 x 30 sec holds, both legs).
- Performed hip flexor stretch (2 x 30 sec holds, both legs).
- Heart Rate (carotid artery) was taken and recorded.
- Performed 2nd non-counter movement jump on the force platform and recorded vertical jump height.
- Ten minute of pause. (No activity was done but subject was in standing position)
- Performed 3rd non-counter movement jump on the force platform and recorded vertical jump height.
- Obtained data of Vertical Jumps and Heart Rate was recorded.

The primary aim for the study is to report the better warm-up protocol for performance. One of the reasons for the aim is that, static stretching as warm-up gives negative influence on performance (Write et al. 2006, p.s280). Muscle activity before the performance delays the fatigue and increases the performance level in humans (Digby, 2002, p 142-143). He also stated that Postactivation Potentiation (PAP) shows improved performance in dynamic muscle work with static muscle work comparatively. There is accumulating evidence of Static Stretching can impair muscle strength, strength endurance,

power, and other components of sports performance (Warran, 2007, p. 213.). These all evidence states that a new warm-up protocol is required to improve the performance of general and sports person. The question “Does stretching improves the performance?” was answered by Ian (2004, p 267-271), he stated that static and dynamic stretching prior to the activity improves the performance, but dynamic stretching is more effective comparatively.

Protocol for Dynamic Group:

- Completed 12 laps (up and back) jogging (up to 60% VO₂ max) in the corridor.
- Heart Rate (carotid artery) was taken and recorded.
- Performed 1st non-counter movement jump on the force platform and recorded vertical jump height.
- Performed tip-toe walking (2 x 10 m, both legs).
- Performed forward/back leg swings (2 x 10 reps, both legs).
- Performed sagittal plane leg swings (2 x 10 reps, both legs).
- Performed walking knee pull-ups (2 x 10 m, both legs).
- Performed walking lunges with hip rotation (2 x 10 m, both legs).
- Performed walking quadriceps stretch (2 x 10 m, both legs).
- Heart Rate (carotid artery) was taken and recorded.
- Performed 2nd non-counter movement jump on the force platform and recorded vertical jump height.
- Ten minute of pause. (No activity was done but subject was in standing position)
- Performed 3rd non-counter movement jump on the force platform and recorded vertical jump height.
- Obtained data of Vertical Jumps and Heart Rate was recorded.

METHOD:

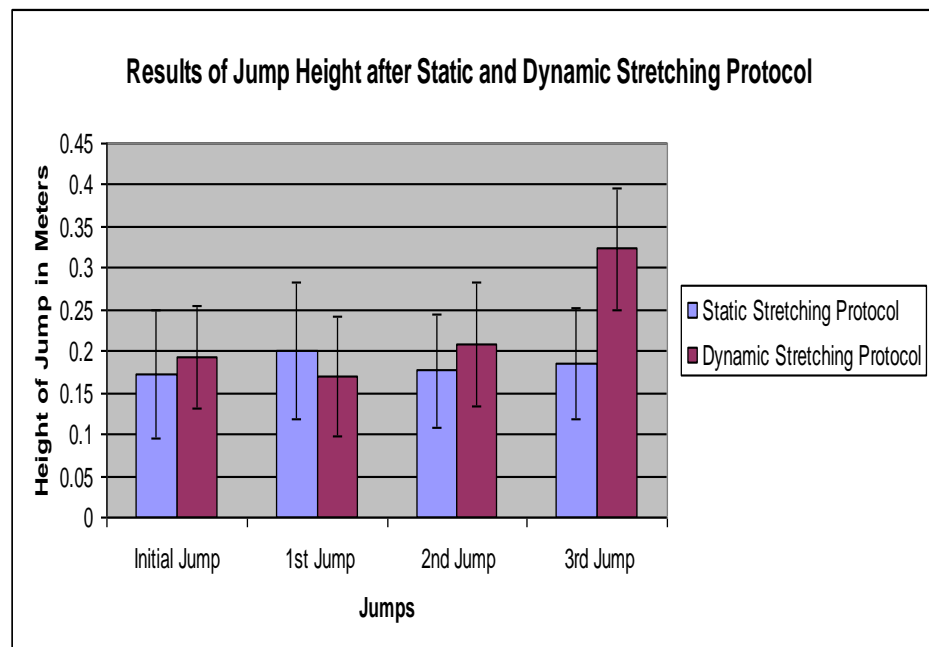
Students were asked to form groups of 2 or 3 persons. Each person would perform either the static OR dynamic protocol. One person is not allowed to do both protocol. An initial Non-Counter Movement Jump (hands are fixed on hips) was performed by both, static protocol and dynamic protocol group. Jump was performed on Force Platform and vertical jump height was recorded. Static Group and Dynamic group completed following

protocols respectively.

RESULTS:

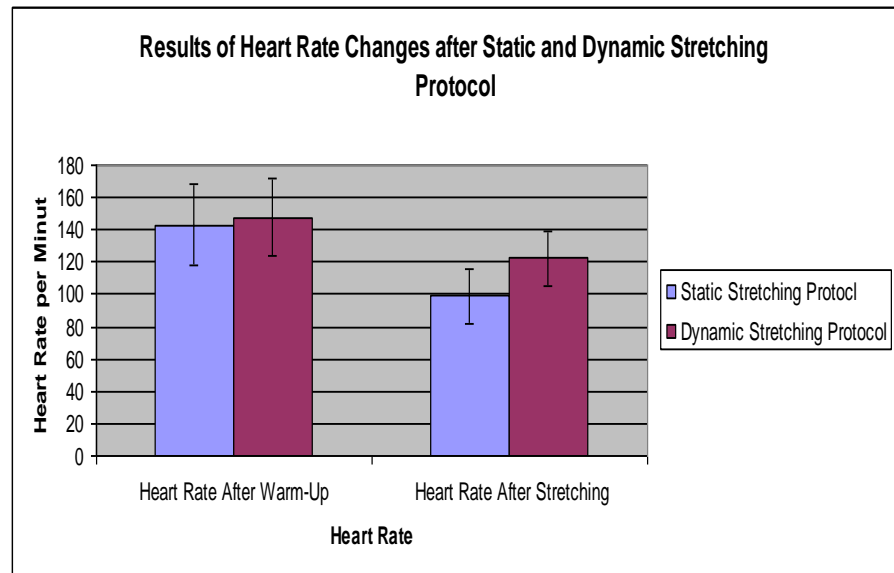
There is an increase of 0.0128 m in Vertical Jump Height with Static Stretching Warm up Protocol. [0.1720 m to 0.1848 m (mean)]

Bar Chart-1: Change in Vertical Height Jump Height with SD.



There is an increase of 0.1307 m in Vertical Jump height with Dynamic Stretching Warm up Protocol. [0.1927 m to 0.3234 m (mean)]

Bar Chart -2: Change in Heart Rate with SD



DISCUSSION AND INTERPRETATION:

As articles mentioned in introduction, warm-up protocols improve the performance. This study shows that, warm up protocol with dynamic stretching shows improved performance then compare to warm up protocol with static stretching.

Results of the study clearly describes that the dynamic stretching warm up protocol improves the performance (gradually increase from initial jump to 3rd jump). As per the results there is an increase of 13 cm (approx) in vertical jump height which is significantly higher compare to static stretching warm up protocol (increase of 1.3 cm approx). This clearly states that dynamic stretching is more effective than static stretching comparatively. There are some previous studies has done on same which also supports the current results.

Ian (2004, p 267-271) reported in his studies that an acute about of stretching doesn't improve force or jump height. He also reported that only regular stretching improves the performance. This study was done on runners. He stated that dynamic stretching before activity improves the performance in maximum voluntary contraction (Ian, 2004 p. 269, fig 3). Pearce et al. has founded in their study that, dynamic stretching as warm-up protocol improves the height in vertical jump then static stretching protocol. In their study, thirteen participants (11 Males & 2 Females) were taken, and three sessions of warm-up were implemented which were separated by one week in between. An initial vertical jump was recorded with Force Platform and then subject were asked to run on treadmill for 5 minutes. Following this Participants underwent static stretching and dynamic stretching warm-up followed by second vertical jump on force platform. Results stated that there was significant difference of 10.7% in dynamic and static stretching warm-up protocol ($p=0.02$). This study supports the results which are found in our studies.

Write et al. (2006, p.s280) reported in their study that static stretching prior to vertical jump decreases the height of vertical jump after that. This study was done with sample size of 36, age group 18 to 30 years. Treatment implemented was 10 mins jogging and static and dynamic stretching respectively. Vertical jump increased significantly ($p < 0.05$) with warm up jogging with dynamic stretching, while static stretch has decreased value.

In our study, the recording of 1st and 2nd heart rate in static and dynamic protocol differs. The decrease of heart rate in static stretching is 44 bpm (143 to 99 beats per min) where in dynamic stretching, its 26 bpm (147 to 122 beats per min), which shows that there is an increase demand of Oxygen and metabolites by muscles in dynamic stretching. In the study done by Jeson et al. (2000, p. R1852) reported that, dynamic muscle work requires more energy compare to static muscle work. During dynamic muscle work, oxygen demand by skeletal muscles is comparatively higher. To meet the higher requirement of oxygen and metabolite for the muscles, heart rate is significantly higher in dynamic stretching. Mechanoreceptor present in muscles and metaboreceptor also play role to increase heart rate and blood pressure (Jeson et al. 2000, p. R1852). He also stated that increase heart rate also helps to quickly wash waste products which are produced during muscular activity and helps to delay the fatigue. Dynamic muscular activity enhances the motor nerve firing and response of muscle contraction to the given threshold of stimulus and thus increases muscular output. Increase in core body temperature improves extensibility of soft tissues so reduces risk of soft tissue injury.

Our study differs with the above mentioned studies with regards to sample size. The inclusive and exclusive criteria also should be determined with regards to limitation of the study. A specified age group and gender should be conformed prior to study to get a proportional ratio of improvement of performance. There are certain limitations for the study which may impair the data. For an example, to know the ratio of improvement of performance in individual, a specific age group should be taken. The ratio of improvement cannot be compared of normal individual with athlete. The new direction of study also can be thought with regards to PNF stretching vs Dynamic Stretching. The study can be also done with athlete groups who either play a skill games like Snooker or badminton or mass activity games like running or discus throw. The study can be designed in such a way to determine that which kind of warm up protocol improves the skill of the performance and which kind of warm up improves the muscle power and thus endurance.

CONCLUSION:

This study can be concluded by favoring dynamic stretching with the reference of previous studies. There is an important role of dynamic stretching warm up protocol prior to activity which dramatically improves the human performance which is significantly higher with static stretching warm up protocol. The increase of heart rate in dynamic stretching is more than of static stretching because of more muscular activity (comparatively) which needs more energy in form of metabolites and oxygen, which is provided by blood with increased heart rate to meet the demand.

One can be recommended to go through a dynamic stretching warm up protocol prior to activity to enhance the work output. Regular dynamic stretching also improves the cardiovascular efficiency. The increased heart rate increases the blood flow through muscles, which quickly washes away the waste products produced during the muscular activity.

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News from the School of Physiotherapy, RKU

- Research Aptitude Test (RAT) and interview for PhD applicant for summer 2012 was conducted on 17th June, 12 in presence of Dr. Nilima Patel, Professor, SGG College of Physiotherapy, Baroda.
- DRC / Review of Literature for doctoral (PhD) students were scheduled on 27th June, 12 in presence of Dr. Lata Parmar, Principal, Sumandeep College of Physiotherapy, Baroda.

- Preliminary Examination for students of Saurashtra University, Rajkot scheduled during 9th June, 12 to 23rd June, 12.
- Continues Internal Examinations II (CIE-II) for students of 2nd semester, School of Physiotherapy, RKU has scheduled during 26th June, 12 to 3rd July, 12.
- Semester End Examination (SEE) for Students of 2nd semester, School of Physiotherapy, RKU has scheduled during 19th July, 12 to 3rd August, 12.

Physiotherapy

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Dr. Priyanshu V. Rathod, PT, PhD



Whole Body Vibration Improves Exercise Benefits in COPD Rehabilitation.

According to a study by Rainer Gloeckl, from the Department of Respiratory Medicine, Schoen Klinik Hospital, Schoenau am Koenigssee, Germany, and colleagues and published in the online November issue of Respiratory Medicine, patients with chronic obstructive pulmonary disease (COPD) show improvements in rehabilitative exercise efforts when the activities are complemented with whole-body vibration sessions.

Exercise Improves Vascular Reactivity in Pre Diabetic Period

people with pre-diabetes who engage in regular aerobic exercise improve their vascular reactivity to nearly normal levels, even if they do not lose weight, researchers lead by Dr. Sabyasachi Sen, from Bay State Medical Center and Tufts University School of Medicine in Boston, said at the American Association of Clinical Endocrinologists 21st Annual Meeting and Clinical Congress.



Physiotherapists gearing up for London 2012

The London 2012 Olympic Games is set to be one of the biggest spectacles the country has ever seen and as the best athletes from around the globe prepare to compete on the 'grandest stage of them all', the UK's physiotherapy teams will also be limbering up for the Games.

Risk of breast cancer can be reduced by exercise

Breast cancer is one of the biggest killers of women across the UK but new research has found that exercise, in any form, can be a key factor in reducing the risk of disease. A team at the University of North Carolina discovered that whether it be mild or intense and before or after the menopause, exercise can prove a vital weapon in the fight against cancer.



WCPT Glossary

The WCPT glossary has been developed to support WCPT's work on policies, guidelines and other resources (eg database of experts, common data set), to ensure consistency in terminology and to aid international interpretation. It has also been developed as a resource in its own right for member organisations, regions and subgroups to use. WCPT is encouraging the use of the international terms where applicable. More info at <http://www.wcpt.org/glossary-list>

Drug dependent people need better access to health care

26 June 2012 -- According to new UN estimates, worldwide about 230 million adults (aged 15-64) used an illicit drug at least once in 2010, including about 27 million people with severe drug problems. A new WHO database addresses this problem with details on the resources allocated to the prevention and treatment of alcohol and drug-related problems in 147 countries.



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