

## PNF Stretching and its Effects on Maximal Exertion Exercises

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### Abstract

**Abstract.** Giordano, N.C., Sikora, D., Jones, A. PNF Stretching and its Effects on Maximal Exertion Exercises. *J. Undergrad. Kin. Res.* 2005;1(1):16-22. The purpose of this study was to see if there were any differences between PNF stretching and improvement on the 40-yard dash and in the vertical jump. To do so we took eight college football players and had them test out in both areas. The test subjects ranged from the ages of 18 to 20 years of age. The mean age of the test subjects was 19.4 with a standard deviation of 1.4. We did not take the height and weight of the players because we did not feel this was a necessary component of the research project. One test consisted of just warming up by running two laps around the track and then running and jumping. A week later we had them come back and do the same routine, but use PNF stretching after the warm-up laps. There was no significant difference in performance measurements between the warm-up vertical jump ( $m=26.25$ ) and the warm-up, plus PNF stretching and 40-yard dash ( $m=26.31$ ).  $T(14) = -.104, p > .05$ . There was no significant difference in performance measurements between the warm-up 40-yard dash ( $m=5.136$ ) and the warm-up, plus PNF stretching and 40-yard dash ( $m=5.098$ ).  $T(14) = .902, p > .05$ . This study demonstrates that an acute bout of PNF stretching does not enhance 40-yard or vertical jump performance.

**Key Words:** Proprioceptive Neuromuscular Facilitation (PNF), Acute, 40-Yard Dash Vertical Jump.

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### Introduction

Warming up for exercise is a very critical part of the workout regardless of the type of workout one is about to begin. It is also stated that a proper warm up decreases the risk of injury; however, he shows no statistical evidence to support this statement (1). He believes that muscles are also better able to perform thus allowing the person that is training to gain full benefits from the work-out that he or she is about to engage in (1). Stretching directly before performing does not benefit the participant (1). He states that stretching before hand actually reduces force and power by 2-5% (1). There hasn't been sufficient evidence to make any conclusions on whether or not stretching before sprinting is beneficial.

Regardless of the level of activity the person is about to engage in or the training level of the individual, studies have shown that proper warm-up benefits individuals by decreasing risk of injury and improving range of motion (2). Warm-up's can range from simply doing static stretches on specific muscles to getting one's heart rate elevated along

with stretching. There is no one way to warm-up before an activity. The only thing that can be said, regardless of the warm-up, is that warming up before engaging in activities reduces your risk for injury as well as prepares your body for the activity it is about to perform (1). It is agreed that stretching reduces risk of injury (2, 3).

There have been many researchers who have compared various stretching techniques to determine which technique is most effective (3). The three main stretching techniques are: static, ballistic and PNF. It is thought that stretching improves flexibility as well as range of motion (3). More importantly, it is thought that stretching improves running economy as well as decreases the risk of injury and possibly decreases delayed-onset muscle soreness (3). Stretching can improve joint range of motion, athletic performance, and posture (4). It is shown however; that effects of stretching on athletic performance, injury prevention, and rehabilitation are not conclusive (4).

PNF, which stands for proprioceptive neuromuscular facilitation, has been proven to show the most gains out of the other stretches (5). Feland also stated that his study proved that individuals had increased range of motion from .6 degrees to 2.4 degrees (3). He said the problem with his study was that these results may be skewed for research being done on younger individuals due to the fact that his sample ranged from 80-93 years old. The research that has been done contradicts itself. To reiterate the fact, Carter stated, “The effects of stretching on athletic performance, injury prevention, and rehabilitation are not conclusive (4).”

The one question that we still had after reading all of these studies was, “does performing PNF stretching actually benefit individuals before they perform a workout?” We wanted to know if performing these stretches before a workout, (more specifically, maximal workouts) would benefit an athlete or result in lower marks than they have scored before. We figured the best way to test these questions was to have individuals do a simple warm-up running around the track two times and having the same individuals do the same warm-up, but this time have them do a number of PNF stretches.

The purpose of our study was to determine the difference in performance between PNF stretching (with warm-up) vs. warm-up without stretching before 40 yard dash and vertical testing. We hypothesize the individuals’ times from running the 40 yd dash will be better (lower times) in the PNF stretching group. We also hypothesize their vertical jump will increase in the PNF stretching group.

## **Methods**

### **Subjects**

The subjects that we used range from the ages of 18 to 20 years of age. There were eight freshman male football players for the University of Wisconsin-Eau Claire which participated in this test. They ranged from being active to trained, depending on the level of condition that they have kept themselves in. This is a convenience sample for this research because we are affiliated with the football team in some way and it is easier to obtain these participants. This study was approved by the University Human Subjects IRB.

### Instruments

The instruments that we used for this study were: 2 Sportline Model 221 stopwatches, the Vertec Vertical Tester and Nylon Athletic Tape. Taking into consideration that the reaction times may be different for different people, we decided that having two timers and averaging out each time would eliminate some of the disparity in 40 times. The Vertec Vertical Jump eliminated error in the results because the subjects needed to actually touch the tester to find out their score. We believe that this experiment is very reliable because these tests can be repeated with little disparity among the test results.

### Procedures

We collected this data on the 200 meter upstairs track in the McPhee Building. The data was collected two separate days in two weeks. The participants were told not to eat anything 2 hours prior to testing and were also told that if they consume alcohol the night before, to do it in a minimal manner. The participants were also told not to do any strenuous activity up to 36 hours prior to testing. We required 2 hours total for the data collection. We started the testing at 2:00 p.m. on Sunday and ended at 3:00 p.m. that same day. On the first day, we informed the subjects to take 2 laps around the track. Each lap took 60 seconds for the participants to complete and we controlled this by actually timing the participants while they are running the laps. If they ran over or under the 60 second mark each lap, we either told them to speed up or slow down accordingly. We then took half of the subjects and did the Vertec Vertical Tester (2 test runs), while the other half did the 40-yard dash (2 test runs). Then we tested the Vertec Vertical Tester's on the 40-yard dash and vice-versa. The best times for the 40 yard dash and Vertical jump were taken for each participant. The standing reach was attained from their marks earlier in the year from the football coaching staff. The next week we tested on the same day at the same time. There was a two lap warm-up on the track. Each lap took 60 seconds for the participants to complete and we controlled this by actually timing the participants while they were running the laps. If they were running over or under the 60 second mark each lap, we either told them to speed up or slow down accordingly. We then did PNF stretching with the group before the testing. The stretches consisted of hamstrings, quadriceps, groin (butterfly) and shoulder stretches and contractions. The subjects who were tested first in the 40-yard dash the week before were tested in the Vertical first the second week and the subjects who tested first with the Vertec Vertical Tester were tested first in the 40 yard dash. The groups then switched. Some of the safeguards that we took were to make sure the subjects have adequate enough room to slow down after the 40 yard dash. We made sure there was nothing in the way of the running lanes. For the Vertec Vertical Tester, we made sure they were jumping and landing on a flat surface. We also made sure there was nothing in the way of the jumpers. The day before we tested, we walked-thru the testing procedures and made sure there would be no complications in the testing procedures.

### Statistical Analysis

After the testing, we used T-testing to determine mean differences between PNF stretching and non-stretching. The independent variables were PNF stretching vs. non-stretching and the dependent variables were an increase or non-increase in performance because of PNF stretching.

## Results

There was no significant difference in performance measurements between the warm-up 40-yard dash ( $m=5.136$ ) and the warm-up, plus PNF stretching and 40-yard dash ( $m=5.098$ ).  $T(14)=.902$ ,  $p>.05$ . There was no significant difference in performance measurements between the warm-up vertical jump ( $m=26.25$ ) and the warm-up, plus PNF stretching and 40-yard dash ( $m=26.31$ ).  $T(14)= -.104$ ,  $p>.05$ .

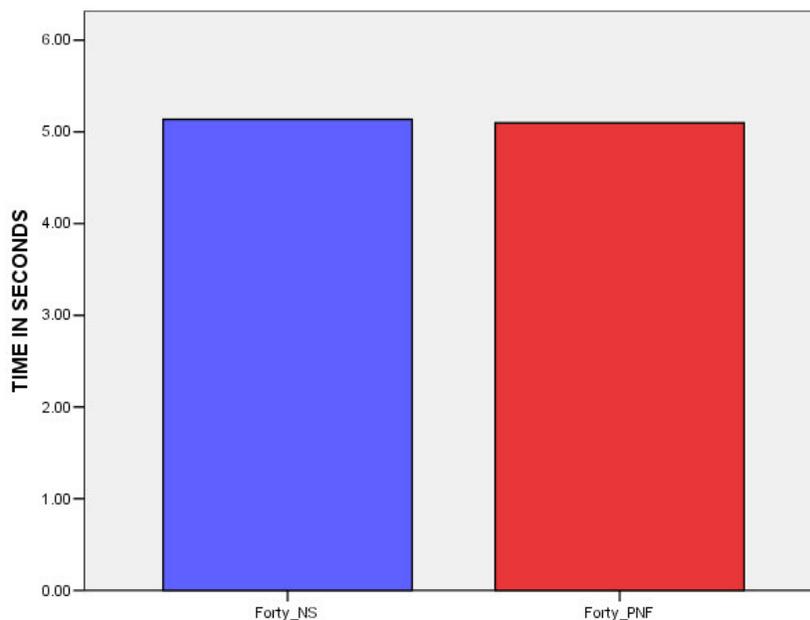


Figure 1. 40 yard dash times for both the PNF and Non-PNF groups

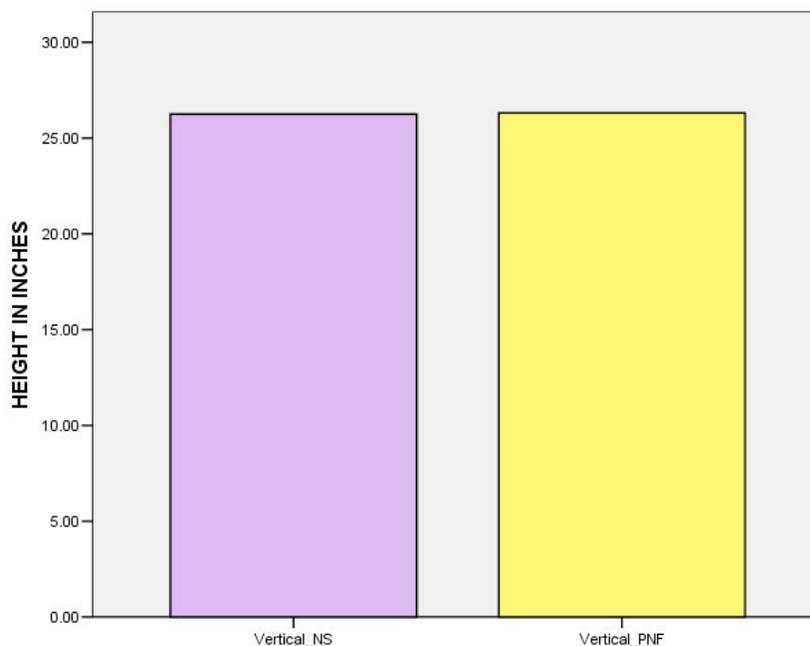


Figure 2. Vertical Jump heights for both the PNF and Non-PNF groups

## Discussion

This study sought to see the difference between warm-up/exercise and warm-up, PNF Stretching/exercise. In this study, it was found that there was no significant difference between the two as indicated by the T and P values when the individuals performed the 40 yard dash as well as the vertical jump. These all showed us that it is not beneficial to do this type of PNF stretches before working out because there is no increase in performance by doing these stretches.

We found out and stated in the introduction that proper warm-up benefits individuals before exercise. It was also stated that “PNF, which stands for proprioceptive neuromuscular facilitation, has been proven to show the most gains out of the other stretches” (6). With that said, we pondered the question, “does PNF stretching actually benefit individuals before they perform a workout?” It has been stated that the effects of stretching on athletic performance, injury prevention, and rehabilitation are not conclusive (7). We wanted to know if PNF stretching and increased performance was conclusive. In our hypothesis, we said that the individuals’ times from running the 40-yard dash will be better in the PNF stretching group. We also hypothesize their vertical jump will increase in the PNF stretching group. There are some things we, as the leaders of the group, cannot control. We cannot control what the individuals eat, drink or do in the day(s) before they perform either one of these tests. By not being able to control these actions of the individuals we may not be able to obtain the numbers we hope to, but none the less, the results shall be very beneficial. It is recommended through our findings that it is not necessary to do PNF stretching before exercises because it does not improve athletic performance, which in this case athletic performance was shown through vertical jump and 40 yard dash. In the future, it is suggested that more participants should be evaluated because it would be better to have a bigger sample size. We feel that a larger sample size would possibly show results that would support our hypothesis. The reason being that there were some individuals that improved their performance and by having a larger sample this number may have been larger and shown more evidence supporting PNF stretching. Among some of the other research studies which looked at PNF stretching are in the bibliography section of this paper, particularly studies 8, 9, and 10. We expected our data to be supported by only some of the past research specifically the research that states that PNF stretching increases athletic performance. This was expected due to the fact that previous studies have contradicted themselves. Our data did support some of the past studies that have shown that PNF stretching does not increase athletic performance. Some of the assumptions and limitations included the assumption that the test subjects performed the same daily routine before the testing, we assumed that the test subjects performed to a maximal exertion both days, and we were limited to the number test subjects (we wanted at least 15 and only tested 8). Other areas of future research could include: the effects of static stretching before performance and stretching and its effects on flexibility.

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have been able to obtain the numbers we hope to, but, none the less, the results shall be very beneficial.

## **CONCLUSION**

Through our research of PNF stretching we have found that performing PNF stretching on top of warming-up before performing the 40 yard dash and vertical doesn't affect performance. From the results of our study we conclude that a well performed warm-up is just as effective as warming-up and stretching. On top of this, it is also less time consuming to only perform a warm-up rather than do a warm-up and a stretch.

These findings will benefit many different individuals. They will benefit coaches and athletes at all levels as well as trainers, both athletic trainers and personal trainers. The results will show these individuals that an acute session of PNF stretching before exercise will not be beneficial to individuals. It is not only helpful to know this, but it is also beneficial to know so one does not waste time performing an acute session of PNF stretching before doing an activity. This can also be carried over into the classroom. Instructors at all levels can teach this to individuals who want to learn proper ways to ready their body for a workout. They will be able to teach individuals that it is not worth spending their time performing warm-up and PNF stretching if they are looking to improve their athletic performance. They should only perform a good warm-up rather than spend time on both PNF stretching and warming-up because they will get the same results from both, but will be done with working out much faster when not performing PNF stretching.

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