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EFFECTS OF A CHRONIC PNF STRETCHING PROGRAM ON SPEED AND EXPLOSIVENESS IN DIVISION 3 COLLEGIATE ATHLETES

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ABSTRACT

Bieze AJ, Gnacinski MR, Rouse AR, Sundberg SA. Effects of a chronic PNF stretching program on speed and explosiveness in division 3 collegiate athletes. Journal of Undergraduate Kinesiology Research. 2006; 2(1): 21-25. **Purpose:** To examine whether or not there is a relationship between chronic PNF stretching, speed and explosiveness. **Methods:** Subjects included a total of 34 division 3 collegiate athletes; 14 football and 20 female soccer players (mean ± SD, age 19.7 ± 1.2 yrs; height 173.0 ± 10.0 cm; weight 73.2 ± 14.7 kg). The subjects were separated into 1 of 2 groups, a control group or a PNF stretching group. The control group stretched on their own while the stretching group was stretched 3 times a week for 3 weeks. All the subjects were assumed to be healthy and in good physical condition. Testing the speed, vertical jump, and flexibility was completed both prior to and after engaging in a 3 week PNF stretching program. **Results:** No significant differences (p< 0.05) were in the forty yard dash before stretching (5.24 ± .45s) and after stretching (5.18 ± .43s) by using a PNF stretching protocol t(15) = 2.083, p=.055. There was also no significant difference (p< 0.05) in vertical jump before stretching (20.87 ± 6.4 in.) and after stretching (21.48 ± 5.4 in.) t(15)= -1.266, = .239. **Conclusion:** This study demonstrates that with chronic PNF stretching there is some improvement in forty yard dash time (.06 sec) and vertical jump (.61 in) however according to our p value; these are not significant differences. There is future research that could be done involving types of lifting programs associated with stretching as well as quadriceps stretching in conjunction with hamstring stretching.

**Key Words:** Proprioceptive Neuromuscular Facilitation (PNF), Stretching, Hamstring, 40-yard dash, Vertical Jump, Goniometer, Sit and Reach, Flexibility, Range of Motion.
INTRODUCTION

Flexibility is defined as the ability of a muscle to extend through a full range of motion. Two ideas related to flexibility are that it can increase performance and decrease the chance of injury (1). There is a great deal discussion over whether or not PNF stretching successfully increases flexibility. A study conducted by Feland and Marin (2004), showed significant improvements in hamstring flexibility via sub maximal contractions using PNF stretching. In correlation, information from a study done by Mayer et al. (2005) indicated that PNF stretching was an effective way of increasing flexibility. Contradicting these two studies is another done by Sikora et al. (2005) that demonstrated no significant improvement in speed and vertical jump after only one session of acute PNF stretching.

Two bouts of stretching that can be used are acute and chronic. For the purposes of our study, we will attempt to answer whether or not chronic stretching has an effect on speed and explosiveness.

Information already known to the fitness world is that PNF stretching is one of the most effective ways to increase flexibility (2). PNF stretching is a combination of active, passive, and resistive stretching (3). Of the several variations that are used, we chose the contract-relax method. Other attempts made in the past to amplify the elasticity of muscle fibers are static (holding certain positions for a prolonged period of time) and dynamic stretching (boosting flexibility through a series of sport specific movements).

Through this program, our goal is to observe if increasing flexibility in the hamstrings muscle group will increase an athlete’s speed in the 40-yard dash and height of the vertical jump. A study conducted by Giordano, Sikora, and Jones concluded that one session of PNF stretching prior to participating in a 40-yard dash and vertical jump test showed no significant improvement in performance (4). In conjunction with their study, Marek et al. contested that PNF stretching prior to an athletic event does not benefit the participant (1). Marek’s study concluded that PNF stretching may actually hinder performance because a decrease in mean power output and peak torque was caused by an acute bout of stretching (1).

The purpose of our study is to determine if increasing hamstring flexibility via PNF stretching will improve an athlete’s vertical jump and speed in the 40-yard dash. The experimental group will be using the three week program and will be compared to a control group. We hypothesized that increasing hamstring flexibility by means of PNF stretching will enhance 40-yard dash time and vertical jump. Significant improvements in our study are thought to be increasing the 40-yd dash time by one-tenth of a second and increasing the vertical jump by an inch to be a significant increase.

METHODS

Subjects
Forty division 3 athletes volunteered for our study; twenty male football players and twenty female soccer athletes. Ten participants from each sport were randomly selected to be placed in a control group that wasn’t stretched and ten in an experimental group that underwent PNF stretching. Each athlete signed a consent form to participate in the study. The University Human Subjects Internal Review Board approved this study and the consent form.

Instrumentation
Baseline pretests consisted of 3 tests: sit and reach, vertical jump, and 40 yard dash. In addition, each athlete’s height, weight, and hamstring flexibility was also recorded using a goniometer. The instruments we use were: 2 Sport line Model 221 stopwatches, a Vertec Vertical jump Tester, Johnson and Johnson Athletic Tape to mark the start and finish line, a Model G300 goniometer and Model 01285 Lafayette Instrument Company sit and reach box to test flexibility, and a Befour digital scale Model PS6600. Three measurements were documented directly after each test and the average of the three were noted. Throughout the study, the contract-relax method PNF stretching was used during each session. The PNF stretching technique included a passive stretch
Chronic PNF Stretching Program

for 10 seconds, followed by a contraction for 6 seconds against manual resistance applied by the evaluator, and another 10 second passive stretch. These steps were repeated 3 times to each leg. In contrast, the control group was administered the baseline pretests, and were advised to continue their normal stretching and workout regime, and told not to do any type of PNF stretching during the 3 week testing period.

**Procedures**

The first week we did a baseline test on all of our athletes. We began with height, weight and goniometric measurements for both legs. After we got these numbers we went to the indoor track and had each of the athlete’s complete two warm-up jogging laps to prevent injury from occurring. Immediately following we had each participant perform one trial of sit and reach, vertical jump, and forty yard dash. This way they would be given an adequate rest and the tests could be completed a little quicker for the whole group. After we got the baseline tests done we randomly chose 10 girls and 10 guys who would be stretched. The stretching routine consisted of PNF stretching three times a week for three weeks. We also kept a log on what days we stretched each individual to keep track that we stretched them three times a week. At the end of the three week period, we did a post test for height and weight to make sure that a change in weight wasn’t a reason for an increase in speed, as well as goniometry for both legs again to prove that we increased flexibility. Again in the indoor track we performed a sit and reach, vertical jump and forty yard dash. We took our results and calculated the outcome which we had collected.

**Statistical Analyses**

During the study, we identified the independent variable as the PNF stretching program in a controlled environment. The dependent variables include vertical jump, 40-yd dash and flexibility values. A comparison was made between the baseline pre-test data and the post-test results in each group. Paired t-tests were used to compare and determine whether or not the differences were significant ($p \leq .05$).
RESULTS

A total of 34 college athletes were used in this study (18-22 years of age). A table of their descriptive statistics is shown in table 1. The average height and weight of the group was 173.03 cm and 73.28 kg. There was no significant difference in the results from the baseline vertical jump test (M=20.87 inches) and post-test results (M=21.49 inches). t(15) = .239, p>.05. There was a slight improvement in the 40-yd dash; however was not a significant increase from the baseline results (M=5.24 sec) and post-test results (M=5.19 sec). t(15)= .055, p>.05. As expected, there was a significant increase in hamstring flexibility among the subjects. The baseline goniometry test for the right leg (M=88.13 degrees) showed significant improvement compared to the post-test (M=93.19 degrees). t(15)= .017, p<.05. Similar significance was also shown in the left leg goniometry with the baseline results (M=89.50 degrees) showing improvement when compared to the post-test results (M=94.56 degrees). t(15)= .031, p<.05. The sit and reach test showed the most significance in relation to PNF stretching with the baseline results (M=12.48 inches) as compared to the post-test results (M=13.45 inches). t(15)= .013, p<.05.

Table 2. Paired Samples Statistics of Participants.

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<th>Pair</th>
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DISCUSSION

Based on the results of our study, we rejected our initial hypothesis that PNF stretching will improve speed and explosiveness. We therefore had to accept our null hypothesis which stated that there will be no significant differences in forty yard dash time or vertical jump before and after chronic PNF stretching. There were no significant differences between the control group and the PNF stretching group.

Our results correlate with previous research that has been done in the field stating there is not a significant increase in speed and explosiveness by using a chronic PNF stretching routine. Although the results we obtained were not significant according to our p value, one must distinguish whether or not the slight improvement would help them in their specific sport. Our research does agree with the results of previous studies attesting that there is a significant increase in hamstring flexibility; which may contribute to injury prevention.

There are a lot of areas that could be researched in conjunction with PNF hamstring stretching. Some include implementing different styles of strength training programs such as lifting for strength, hypertrophy, or endurance along with a chronic stretching program. Another area may be including both hamstring and quadriceps PNF stretching to increase performance.
Assumptions that we made is that the athletes were in peak physical condition, and. We must also assume that no outside factors affected results such as meals, alcohol, or other enhancing drugs. Some limitations that we encountered during this experiment were that our goniometry readings were all done manual. We made sure the same person did all the readings, however it is a subjective measurement so we only have a certain degree of accuracy. Another limitation was the amount of effort each athlete put into the contract phase of their stretching. The harder some athletes tried, the more we noticed an improvement in their flexibility. When timing the forty yard dash, there were two different people using the stop watches so their degree of accuracy was also a limitation. The final limitation is the amount of effort each athlete put into their tests. They may have tried harder in the post tests due to the fact that they wanted to see improvement for themselves. In addition, there were 3 participants that were unable to complete the post-test due to injury. Their data was excluded from the final results.

CONCLUSIONS

In conclusion, it was determined that there was no significant evidence to suggest that PNF stretching increases speed and explosiveness. Even though our data does not show a significant difference between, there is enough evidence that will be useful to athletes and coaches when devising a training program. Our evidence did suggest that there were improvements in flexibility gains. This could be beneficial because it can prevent future hamstring injuries that may occur. Since there were no significant changes in performance, it shows that there is no harmful effect that stretching would have before an athletic event.

Along with athletes and coaches the findings of this study can benefit athletic trainers. When an athlete gets injured, athletic trainers get a first hand look at how inflexible their athletes are. Drastic improvements can be accomplished via PNF stretching to increase their flexibility.

ACKNOWLEDGEMENTS

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REFERENCES


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