

Proposal

Intro and aims

For my project I will be exploring the effects of Proprioceptive Neuromuscular Facilitation (PNF) stretching on a person's power and strength. These components will be compared with each other to decide which one the stretching technique has a greater effect on. This will be done with individuals within the sport of rugby due to the high demand of these fitness components with their sport.

PNF is described as 'a stretching technique utilized to increase ROM and flexibility' as well as 'to improve muscle elasticity and has been shown to have a positive effect on active and passive range of motions' (Funk et al., 2003) and is widely used with all types of athletes, healthcare professionals and individuals.

The method of how this stretching technique is done says that 'the target muscle (TM) being lengthened and held in that position while the participant contracted the TM to its maximum isometrically for an allotted amount of time. This was followed by a shorter relaxation of the TM that usually included a passive stretch' (Etnyre and Abraham, 1986). Different variations of this can be carried out with different time frames being used for the contraction part of the exercise.

Funk et al has described the effects of this type of training by explaining 'PNF increases ROM by increasing the length of the muscle and increasing neuromuscular efficiency' he has then added to this statement by saying 'Effects can last 90 minutes or more after the stretching has been completed'.

The component of fitness strength has been described as 'the extent to which muscles can exert force by contracting against resistance' (Mackenzie, Brian. 2019). With an example being holding or restraining an object or person. This component can be categorised into three types including static strength where the muscle contracts and holds a position, dynamic strength where the muscle contracts and extends while moving and explosive strength where the muscle contracts at high speed.

The power component is described as being 'the ability to exert maximum muscular contraction instantly in an explosive burst of movements' (Mackenzie, Brian. 2019). This component of fitness is made up of a combination of strength and speed and is alternatively known as explosive strength.

Rugby union (RU) has been widely determined as being 'a high contact field-based team sport which consists of an 80-min game' (Duthie, Grant, et al. 2003) with this being broken up into two 40-minute halves with a break of no longer than 15 minutes in between. The description of the game played is said to be composed of 'collisions and intermittent exercise, where short periods of maximal or high intensity activity' (Duthie, Grant M, et al. 2006) which includes sprinting, tackling, rucking, scrummaging, and mauling, only lasting short periods of time of between approximately 5 seconds and 15 seconds.

The reason I have chosen to base my project around the sport of rugby is because of the demand these specific fitness components are said to have within the sport as proved by Redman, Kellyanne J., et al. (2021) when stating 'The ability of a rugby league player to express high levels of strength and power is crucial for success in competition.' This means that if the stretching technique Proprioceptive

Neuromuscular Facilitation (PNF) shows to have a positive effect by increasing these components it would be a useful tool to use within the sport potentially some point around training or before a game.

The aim of the research project is to assess if there is an impact made from performing Proprioceptive Neuromuscular Facilitation (PNF) on rugby individuals to their strength and power components to deem if this is a successful technique to use on these specific athletes.

Method

For this independent project to be carried out A baseline test will need to be done on all individuals Which consists of performing on the Keiser leg press machine and collecting the data which correlates to the person's strength and power. The Keiser leg press machine is described as 'a pneumatic resistance-based seated leg press machine' (LeBrasseur, Nathan K., et al. 2008) Which enables testing of an individual's maximal strength and power of their lower limbs that can be applied to sporting specifics due to the movements of the machine being similar of that in certain sports.

After the baseline scores have been recorded the stretching technique Proprioceptive Neuromuscular Facilitation (PNF) previously described by Funk et al., (2003) as being utilized to increase ROM and flexibility while improving muscle elasticity will be applied to each individual. This is done by the therapist or other assistant pushing and holding the lower limb of a participant in a lengthened position as far as it can go which stretches the muscle used (which in this case is the hamstring). The individual contracts this muscle pushing against the therapist for around 10 to 15 seconds. They then relax briefly followed by the limb being pushed up again into a stretch and the same method repeated 3 times to complete the technique.

This technique will be shown and taught to all the volunteers to be able to perform it on each other with supervision to ensure it is being carried out correctly and safely. This will allow for a much quicker trial process avoiding the risk of the participants being bored due to waiting for a while for their turn at receiving the treatment. Also giving them all more hands-on involvement increases the enjoyment of the activity which will reduce the risk of the participants dropping out of the study meaning a more optimal outcome due to a wider amount of individuals results collected.

When each individual has had the Proprioceptive Neuromuscular Facilitation (PNF) technique performed on them they will then again perform on the Keiser leg press machine. When redoing this machine, it will calculate the persons leg strength and power by making a pressing movement to extend the legs, the power is worked out from the legs being pushed as quick and powerful as they are able to. The machine increases the weight of the panels until the individual is not able to press it anymore giving their maximum strength calculated with the weight they are able to press.

The results of both strength and power will be recorded the same as the original baseline results to later be compared to answer the question of the study.

To further on this research project results for both strength and power again using the Keiser leg press machine will be measured in intervals up to 80 minutes. This will allow to see how long lasting the

results of the PNF stretching technique are and the 80 minutes would be linked to see if they can last throughout the entirety of a rugby game which is played for this amount of time.

Data analysis

To analyse the data that will be collected during the research project, a graph will be created with all the results from before the Proprioceptive Neuromuscular Facilitation (PNF) stretching technique is performed and also the results that appear after. A bar graph will be used to see the difference more simply between the results of before and after and if the results of each increase or decrease. Separate graphs will be created to individualise the results of both power and strength to investigate if one of these components were affected by this stretching technique more than the other or one not at all. The results conducted from the study using the Keiser leg press machine will be plotted onto the bar graph individually from each participant to investigate the difference made. This will allow the possibility to see if it may have had a positive effect on certain individuals and maybe not on others.

With the further results showing the lasting effects of the stretching technique separate graphs for each individual will be created to see how the effects last for each person. For this part of the study the baseline results will not be added to the graph and just the multiple post treatment results to show if there is a drop off time for these results and at what time this is to confirm how long the technique is able to last for.

Timetable

The study will be conducted within the time frame of one day with the baseline test on the Keiser leg press calculating strength and power of the lower limbs being performed in the morning. The Proprioceptive Neuromuscular Facilitation (PNF) stretching technique will be explained and performed a little while after the initial results are collected to give time for the individuals to relax again and rest from the previous exercise.

After the stretching technique is performed on each individual the leg press exercise will be performed almost immediately after to be able to see the immediate effects the treatment has on these components. Then further tests will be performed in four 20-minute intervals adding up to the time of 80 minutes which imitates the time of a full rugby match. This will allow the idea to see if this type of technique is suitable to use within rugby players to temporarily improve these components of strength and power before a game or training session to have a positive effect during this.

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