The Science of Health, Nutrition and Fitness

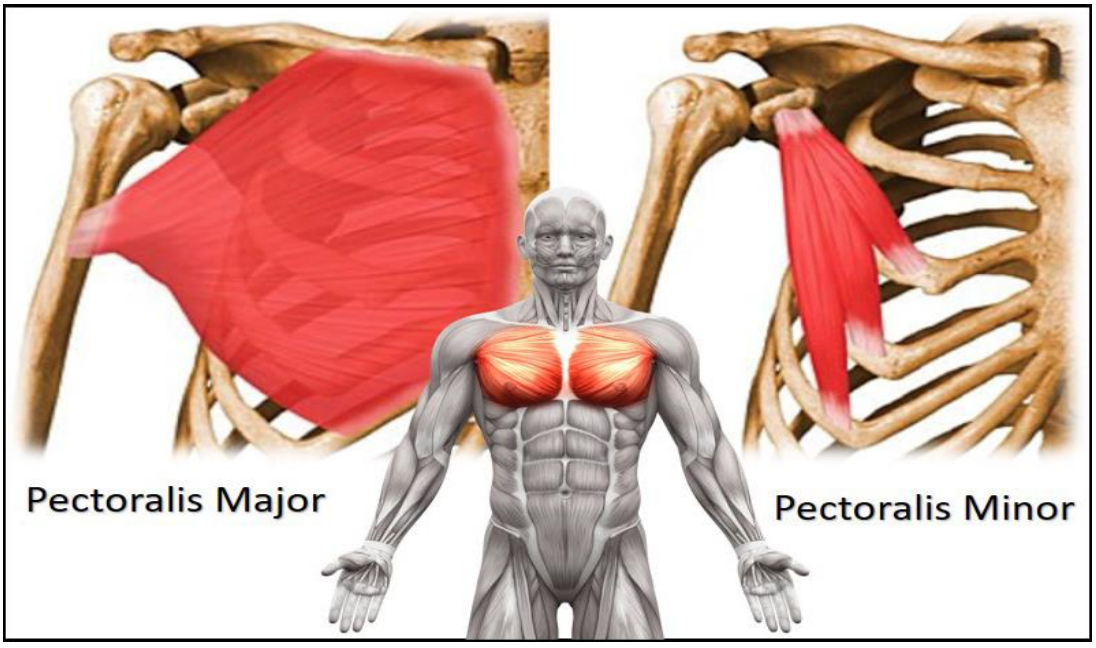
Working the Pecs: Flat, Incline or Decline? **Author: Carl Conroy**

If you enter any gymnasium you will inevitably see many designs of pectoral machine that claim to work the chest in many wondrous ways. Enter the free weights section and you will see a multitude of chest 'approaches' being applied ranging from extreme inclines to below 45 degree declines. What is the science behind this increased range of motion within the scope of chest work? Which angle is best for complete development of the chest muscle fibres?

Before we discuss the research behind bench angle and chest stimulation lets first analyse the structures of the chest and the premise behind the suggestions of varying bench angle. The chest muscles being targeted primarily when benching are the Pectoralis Major and Pectoralis Minor muscles.

Structure

The Pectoralis Major, as its name implies is the largest structure of the chest muscle region. Its origins occur in several areas. Its upper fibres originate on the clavicle bone where they attach in close location to the sternoclavicular joint. Many of the fibres of the Pectoralis Major originate on the anterior surface of the sternum. This is the major area of attachment for the origins of this muscle. Attachment also occurs at the upper six costal cartilages and the aponeurosis of the abdominal oblique. The insertion of the Pectoralis Major occurs in one location only which is the bicipital groove of the humerus. It attaches to the periosteum of the bone at this location. From this information it can be determined that if an injury were to occur to the Pectoralis Major, due to the structure of this muscle it would most likely occur at the insertion area. The Pectoralis Minor has its origins on the 3rd, 4th and 5th ribs, arising on their anterior surface. Its insertion arises on via tendinous structures to the medial aspect of the coracoid process of the scapula. In some instances part or all of the tendon may transverse this process and continue into the coracoacromial ligament; a strong triangular band, extending between the coracoid process and the acromion.



Functions

The Pectoralis Major has several functions. These functions include shoulder flexion, internal rotation and adduction. The Pectoralis Minor is primarily responsible for protraction and depression of the scapula. These functions should be considered when you consider choice of exercise and potential muscular effect.

Research and Bench Angles

Study: *Lauver J.D. et al (2016)*

This research encompassed a study on bench angles set at 0°, 30°, 45° and -15°. They used 14 healthy males (21 +/0.4) who carried out one set of six repetitions for each bench press condition; at 65% one repetition maximum. Surface electromyography (sEMG) was used to determine the extent of muscular activation during the repetitions. Both eccentric and concentric phases were analysed in all bench angles. Additionally, each phase was subdivided into 25% contraction durations, resulting in four separate time points for comparison between bench conditions.

Results

The following conclusions arose as a result of this study:

- No significant difference during any of the bench conditions when examining the complete concentric contraction.
- Greater muscle activation in upper pectorals during 26-50% contraction phase 30° [122.5 ± 10.1% maximal voluntary isometric contraction (MVIC) and 45° (124 ± 9.1% MVIC) bench conditions. This result indicated greater sEMG compared to horizontal (98.2 ± 5.4% MVIC) and -15 (96.1 ± 5.5% MVIC).
- sEMG of lower pectoralis was greater during -15° (100.4 ± 5.7% MVIC), 30° (86.6 ± 4.8% MVIC) and horizontal (100.1 ± 5.2% MVIC) bench conditions compared to the 45° (71.9 ± 4.5% MVIC) for the whole concentric contraction.

Conclusions

Lauver *et al* concluded that,

> *'This study supports the use of a horizontal bench to achieve muscular activation of both the upper and lower heads of the pectoralis. However, a bench incline angle of 30° or 45° resulted in greater muscular activation during certain time points, suggesting that it is important to consider how muscular activation is affected at various time points when selecting bench press exercises.'*

Therefore this study has determined that flat bench press alone does have a huge stimulatory effect on all sections of the Pectoralis muscle and is a valid overall exercise. But the research also identifies that raising or lowering the bench might have additional 'specific' targeted effects on areas of the upper or lower chest.

Study: *Trebs A.A. et al (2010)*

Trebs *et al* carried out research with the participation of fifteen healthy male subjects. The study compared the activation of the clavicular head and the sternocostal head of the pectoralis major and the anterior deltoid when performing the bench press at several different angles, which were; 0^{o}, 28^{o}, 44^{o}, and 56^{o} above horizontal. 70% of their respective 1 repetition maximum bench press was used for each angle. Electromyography activity was recorded during each repetition.

Results

The following conclusions arose as a result of this study:

- Activation of the clavicular head of the pectoralis major was significantly greater at 44 degrees compared to 0 degrees, at 56 degrees compared to 0 degrees and at 44 degrees compared to 28 degrees.
- Activation of the sternocostal head of the pectoralis major was significantly greater at 0 degrees compared to 28 degrees, at 0 degrees compared to 44 degrees, at 0 degrees compared to 56 degrees, at 28 degrees compared to 56 degrees, and at 44 degrees compared to 56 degrees.

Conclusions

Trebs A.A. *et al* concluded that,

> *'To optimize recruiting the involved musculature, it would seem that performing both the flat and incline chest press exercises is necessary'.*

Therefore Trebs *et al* are concluding that changing bench angles during a workout is advantageous towards the goal of overall, or specifically focused chest muscle development.

Recommendations

Considering these two studies in isolation it would seem that using both flat and inclined bench press strategies would be advantageous to overall chests development. In doing so consider the following:

- Inclined positions place more stress on the shoulder structures so employ good training practice including significant warm-up and 'tight' controlled exercise technique.
- Incline angle should be between 30^{o} and 45^{o}. Any angles that are higher than this will not elicit further stimulus to the targeted muscles but will place more emphasis on shoulder structures.
- A horizontal bench will more fully stimulate the sternocostal heads of the pectoralis major and so should be a fundamental aspect of any training routine.

References

Lauver J.D., Cayot T.E., Scheuermann B.W. (2016) Influence of Bench Angle on Upper Extremity Muscular Activation during Bench Press Exercise. European Journal of Sports Science, 16(3):309-16

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