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KANDIDATUPPSATS

Investigating the effects of pre-exhausting a synergist prior to a compound exercise.

An electromyographic study

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Abstract

Background: Pre-exhausting a synergist prior to a compound exercise has been shown to alter the firing patterns in the muscles during the exercise. Pre-exhausting a muscle is done by exercising a muscle group to fatigue with a single joint exercise prior to an exercise.

Aim: The purpose of this study was to further investigate the effects of pre-exhausting the triceps brachii prior to performing a bench press, measuring the EMG activity in pectoralis major, triceps brachii and deltoid anterior.

Methods: 30 participants, men (n=15) and women (n=15), performed two different protocols (T1 and T2) while the muscle activity was measured with surface EMG. Electrodes were placed on pectoralis major, triceps brachii and deltoid anterior. Maximum voluntary isometric contraction (MVIC) was performed prior to performing protocols in order to get reference values.

Results: Pectoralis major and deltoid anterior activation was significantly higher when pre-exhausting triceps brachii before bench press compared to no PRE, but no significant increase was seen in triceps brachii (p=0.000, p=.0009 and p=0.405 respectively) MVIC expressed in percentages and mean values ± standard deviation during protocol T1 for pectoralis major 45.3(±12.4), triceps brachii 56.28(±15.9) and deltoid anterior 63.45(±31.4) and during protocol T2 pectoralis major 56.41(±18.4), triceps brachii 58.49(±20.07) and deltoid anterior 71.65(±42.7).

Conclusion: These results suggest that pre-exhausting a synergist prior to a compound exercise may change the muscle activity in the involved muscles. This can be used in a practical sense to develop weak points in the muscles by changing the activation pattern in the muscles hence being able to target specific muscles better.

Abstrakt

Bakgrund: Att föruttrötta en synergist innan en basövning har visat sig ändra musklernas aktiveringsmönster. Förutrötta en muskel kan man göra genom att utföra en en-ledsövning innan en basövning.

Syfte: Syftet med denna studien var att undersöak effekter av att för-uttrötta triceps brachii innan en bänkpress samt att mäta EMG-aktiviteten i pectoralis major, triceps brachii och deltoid anterior.

Metod: 15 män och 15 kvinnor utförde två olika protokoll (T1 & T2) samtidigt som vi mätte muskelaktiviteten med yt-EMG. Elektroder placerades på pectoralis major, triceps brachii och deltoid anterior. Maximala isometriska voluntära kontraktioner (MVIC) utfördes för att få referensvärden.

Resultat: Pectoralis major- och deltoid anterioraktiveringen var signifikant högre efter föruttröttning av triceps brachii före bänkpress än utan föruöttröttning. Ingen signifikant skillnad observerades i triceps brachii. (p=0.000, p=0.009 och p=0.405 för respektive muskelgrupp) MVIC-värdena visade i procent samt medelvärden och standarddeviation för protokoll T1: pectoralis major 45.3(±12.4), triceps brachii 56.28(±15.9) och deltoid anterior 63.45(±31.4) och för protokoll T2: pectoralis major 56.41(±18.4), triceps brachii 58.49(±20.07) och deltoid anterior 71.65(±42.7)

Konklusion: Dessa resultat visar att föruttröttning av en synergist innan en basövning kan ändra muskelaktiveringen i involverade muskler. Detta kan användas i praktiken för att utveckla svaga punkter i muskulaturen då aktiveringsmönstret förändras hos musklerna.

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1. Background

The order of exercises during resistance training has been shown to affect several important key factors in resistance training. Repetition performance, force, power and muscle volume have all been seen to get affected depending on how you sequence your exercises (Miranda, Simão, Vigario, de Salles, Pacheco & Willardson, 2010; Baker & Newton, 2005). Therefore it might be of importance to design a resistance training program in an order that fits the individual's goals. In the beginning of a weight training program increases in strength are fast and mainly due to the neural adaptation. The possible mechanisms of neural adaptation are increased motor unit recruitment and improved firing patterns (Sale, 1988). When the early neural adaptations begin to slow down the weight training progress slows down as well and it is not unusual for advanced athletes to experience plateaus or decrements in athletic performance. To overcome these plateaus several different training methods and training systems have been developed such as periodization, daily undulating periodization, supersets, myoreps, pre-exhaustion (PRE) and priority system (PS) (Fleck, 1999; Fry & Kraemer, 1997).

1.1 Electromyography

Electromyography is a method that is used to measure neuromuscular activity in the muscles. In this study surface EMG has been used which is both cheaper, more available, not as intrusive and doesn't require skilled personnel like the other option, intramuscular EMG, which requires needles to be inserted into the muscle belly. Surface EMG has been shown to have a reliability and validity similar to intramuscular EMG (Kuriki, Azevedeo, Takahashi, Mello, Filho & Alves, 2012; Marshall & Murpy, 2003).

1.2 Muscle fibers and hypertrophy

Human skeletal muscle does not contain one group of fibers with similar properties, rather research has shown that the human body contains two main types of muscle fibers (type I and type II). These two main types differ in the way they produce adenosine triphosphate (ATP), the type of motor neuron innervation and the type of myosin heavy chain expressed. The proportions of these muscle fibers vary among individuals and muscle groups, but no difference has been seen between the women and men. The two different types of muscle fibers are usually referred to as slow-twitch fibers (type I) and fast-twitch fibers (type II). The type II fiber has been divided into three sub groups, type IIa, type IIx and type IIb (McArdle, Katch & Ktach, 2001). Fast-twitch fibers exhibit four characteristics that are important for the fibers rapid energy generation for quick and powerful muscle actions according to McArdle et al. (2001). The fast twitch fibers have a high capability for action potentials, a high myosin ATPaste acitivty, rapid calcium release and a high rate of cross bridge turnover.

Traditionally type II fibers are thought to increase more in cross-sectional area (CSA) than type I fibers, due to their heavy involvement in heavy lifting, however this could be a result of the training regimen used and its specificity for training that activates type II fibers (Deschens & Kraemer, 2002; Ogborn & Schoenfeld, 2014). The general belief is that type II muscle fibers have a greater growth potential (higher rate of hypertrophy) than type I fibers when doing resistance training for hypertrophy. However type I muscle fibers can also be developed through resistance training, therefore it might be of importance to actively try to target both type of muscle fibers while strength training for maximal hypertrophy of the whole muscle (Ogborn & Schoenfeld, 2014; Thorstensson, Hultén, von Döbeln & Karlsson, 1976). Campos et al. (2002) showed that training with higher repetitions and low loads might lead to a preferential growth of the type I fibers, however Schuenke et al. (2012) shows that this might not be the case. Mitchell et al. (2012) saw an increase in type I CSA by nearly twice as much while training with weights at 30% 1RM. The other group trained with weights of 80% 1RM and increased both type I and type II CSA by the same size. Since the muscle CSA is strongly correlated with muscular strength a primary goal for many athletes involved in strength and power sports is to increase muscle mass and induce hypertrophy (Maughan, Watson & Weir, 1983). As Ogborn & Schoenfeld (2014) have suggested the optimal way to induce hypertrophy in both type I and type II muscle fibers might be to include both heavy low repetition training and light/moderate high repetition training. When doing resistance training and inducing hypertrophy the majority of the hypertrophy comes from an increase of sarcomeres and myofibrils. When performing resistance training it causes the myofibers and related extracellular matrix to experience perturbations which sets of a chain of events that leads to an increase in the size and number of sarcomeres. This causes the muscle to grow and get a bigger CSA. Muscle hypertrophy is balanced by the protein synthesis and degradation. Exercise in itself has a positive effect on muscle growth but in order to achieve muscle growth the protein synthesis needs to exceed the protein breakdown and therefore resulting in a positive muscle protein balance (Tipton & Wolfe, 2001; Schoenfeld, 2010).

1.3 Bench press

Several EMG studies have been performed on the exercise bench press. Pinto et al. (2013) had their subjects performing bench presses at 60, 70, 80 and 90% of their 1RM. In this study, the researchers saw an increase in EMG with an increased relative weight in pectoralis major but the anterior deltoid did not show a significant increase between the 80-90% increase in load. Triceps brachii also seems to increase in muscle activity with increased loads. McCaw et al. (1994) saw a greater muscle activity in the heavier loads between 60-80% of 1RM.

1.3.1 Grip width

Lehman. (2005) saw no difference in the muscle activity of the clavicular head of the pectoralis major muscle with three different grip widths but they observed an increased muscle activity when using middle (100% bi acromial width) and wide grip (200% bi acromial width) compared to a narrow grip (1 hand width apart). They also saw the greatest muscle activity in the triceps brachii with the narrow grip width. Barnet et al. (1995) got the same results as Lehman. (2005) and compared narrow (100% bi acromial width) and wide (200% bi acromial width) grip width on the pectoralis major and saw a superior increase with the narrow grip width in the clavicular head of the pectoralis muscle but saw no difference in the sternocostal head.

1.4 Pre-exhaustion

PRE is a method where a muscle group or a specific muscle, in this case triceps brachii, is intentionally fatigued in a single joint exercise before performing a compound exercise (an exercise that works multiple muscle groups simultaneously) that uses the same muscle. Bodybuilders in the United States and weightlifters in the former Soviet Bloc were the first to apply different types of PRE to their training regimen (Fry & Kraemer, 1997). For example, a trainer might suggest that his client performs triceps extensions (single joint exercise) prior to a bench press (compound exercise) to fatigue the triceps brachii muscle leading to greater involvement of the chest muscles. This method is not exclusive and a number of PRE regimes are used e.g. dumbbell flyes to PRE chest muscles before doing a bench press since the triceps brachii musculature can be the limiting factor of the exercise and therefore holding back chest muscle (pectoralis major) activation potential (Fleck, 1997; Brennecke, 2009). However, the scientific literature is contradictory regarding the applications of the PRE training method. Augustsson et al. (2003), looked at the quadriceps muscle activity while performing a leg press (10RM resistance) with and without PRE of the quadriceps with knee extensions. They observed a decrease of the measured EMG activity in the rectus femoris and vastus lateralis muscles when the subjects performed knee extensions prior to the leg presses. The number of repetitions performed in the leg press also decreased after PRE. The researchers propose that other muscle groups such as the gastrocnemius and the adductors could have taken over some of the workload and become more active.

Gentil et al. (2007) investigated the effects of PRE on upper body muscle activation. This study recorded the EMG activity from triceps brachii, anterior deltoids and pectoralis major during PRE and priority system (PS). The pectoralis major was pre-exhausted with the peck-deck exercise and the PS protocol involved performing the bench press prior to the peck-deck. Peck-deck is a single joint movement exercise for the chest. The conclusion was that PRE with peck-deck prior to bench press leads to similar EMG response in the anterior deltoid and pectoralis major muscle, but the triceps brachii showed an increase in EMG response. The researchers also looked at performance, total repetitions and total work, where the performance was decreased in the bench press when pre-exhausting with peck deck. Both Gentil et al. (2007) and Augustsson et al. (2003) pre-exhausted the primary mover of the exercise but Guarascio et al. (2016) looked at the effects of pre-exhausting a secondary synergist to a primary mover in a compound exercise (i.e. triceps brachii in benchpress). The researchers found a significantly higher activation of the pectoralis major in the PRE group compared to the non-PRE group.

Previous research on PRE shows that PRE of the primary movers may result in lower activation of the targeted muscle and due to this the activation of synergistic muscles may increase to compensate, like Guarascio et al. (2016) obvserved.

Guarascio et al. (2016) only had 12 male participants and only looked at the pectoralis major activation with and without PRE, therefore requested more studies to be made in this area to confirm or dispute their results and give further insight towards how surrounding muscles get affected. Therefore, this study will also look at the effects of pre-exhausting triceps brachii prior to a bench press.

1.5 Aim

The purpose of this study was to investigate the effects of pre-exhausting a synergistic muscle (triceps brachii) prior to performing a compound exercise (bench press), the muscle activity in triceps brachii, anterior deltoid and pectoralis major was measured with EMG.

2 Methods

2.1 Participants

15 healthy men and 15 women (age 18-30) were recruited for this study (Table 1). Inclusion criteria were that the subjects needed to have been performing resistance training for at least a year with three training sessions per week where at least one session per month involved bench press. Exclusion criteria were if they had an upper-body injury or other health conditions that can hinder the participation of the exercises involved in this study. All subjects were aware of the purpose, procedures and risks involved in participating in this

study. Recruitment of subjects were done by personally reaching out to people and posting notes on a local college.

Table 1. Subject data presented with mean and standard deviation.

	Men (n=15)	Women (n=15)
Age (years)	24.3 ± 3.0	26.5 ± 4.2
Height (cm)	182.4 ± 8.1	165.7 ± 5.6
Weight (kg)	86.1 ± 10.0	66.4 ± 10.0

2.2 EMG

Recommendations on EMG and how to analyze it followed the recommendations made by the International Society of Electrophysiology and Kinesiology (Soderberg & Knutson, 2000; Standards for reporting EMG data, 2016). All EMG measurements was taken on the right side of the body. Before the electrodes were placed on the muscles the subject was shaved on the points of interests, alcohol was used to clean the site. EMG electrodes was placed parallel on the muscle fibers and the muscles was palpated according to (Zipp, 1982). A base value and reference value was measured by instructing the subjects to perform a maximum isometric voluntary contraction in all muscles that was measured by EMG (e.g. pectoralis major, triceps brachii and anterior deltoideus). The isometric contractions were repeated three times with one-minute rest between. Additionally, to getting a base- and reference value it also confirmed or refuted that the correct muscles are being measured.

A reference electrode was placed perpendicular to the other electrodes to avoid cross talk signals from adjacent muscles. The analysis was made using the mean of the EMG signals calculated from the repetitions performed excluding the first and last repetitions. The EMG signals was recorded using Mega WBA (Mega Electronics Ltd 2011) and analysed using MegaWin 3.1 software. Electrodes might need tape to be held in place. The validity of surface EMG has been found to be viable in a study done by Marshall et al. (2003) where they came to the conclusion that surface EMG is a viable method to assess the neuromuscular response. Raw EMG data were analyzed using MegaWin software (version 3.1). Area of interest was used to visually identify and select the correct repetitions and EMG data. The amplitude was normalized to the mean of the peak EMG values obtained during the maximum voluntary isometric contraction (MVIC) tests.

2.3 Study design

2.3.1 Standardizing exercises

Participants began by lying horizontally on the bench with the gluteus maximums, lower back, upper back and head planted on the bench while gripping the barbell with fully extended elbows. The feet were placed on the ground with full sole contact, according to the guidelines recommended by the National strength and conditioning association (NSCA) (Baechle & Earle, 2012). Participants then lifted the bar off the rack and isometrically held this position until instructed to perform the bench press with a constant velocity of 4 seconds per repetition (2 seconds in the concentric phase and 2 seconds in the eccentric phase) (Gentil, Olivieira, Carmo & Bottaro, 2007). The tempo was automated by a metronome to assist the subjects. Grip width for the bench press was normalized by measuring the subjects' biacromial width. 165% of the bi-acromial width was used to determine the grip width on the barbell according to Simpson et al. (1997), the width was measured as the distance between the thumbs on the barbell. Triceps brachii extensions were used to pre-exhaust and weight plates from Eleiko was used. The subjects performed triceps brachii extensions behind the neck while standing next to the bench to be able to lay down and perform bench presses instantly after the PRE.

2.3.2 Determination of 10 Maximum Repetition Load

Subjects were educated on the NSCA guidelines on the bench press and the standardized bi-acromial width was used as well as the automated metronome with a 2-0-2 (eccentric, isometric, concentric) tempo. The load for the 10RM test session was determined for each subject in the bench press. A weight that can be lifted for 10 consecutive repetitions at a constant velocity of four seconds per repetition was the goal. If the subjects performed more or less than 10 repetitions the weight was adjusted by 4-10kg and a minimum of 5-minute rest was given before the subject attempts the test again. This is enough rest according to Salles et al., (2009).

2.3.3 Testing procedures

Subjects were instructed not to perform any resistance training that involves the pectoralis major and triceps brachii 48 hours before both test sessions. Subjects performed a warm up session on the bench press that includeded 12 repetitions at 50% of their estimated 10RM maximum load. After the warm up session EMG electrodes were applied to the pectoralis major, triceps brachii and anterior deltoideus and then maximum voluntary isometric contraction (MVIC) was recorded for comparison of muscle activity with or without PRE. One MVIC was performed against a fixed resistance in the smith machine. The setup was as a regular bench press as described as above but the elbow joint was fixed at 90°. (Konrad, 2006) The same exercise was used as MVIC for all three muscles since it gave the highest MVIC values therefore not following the exact guidelines of Konrad (2006). We recorded the highest values using one exercise for all muscles than three separate which is what Konrad recommends in his guidelines. The average MVIC value of the 3 MVICs was then used as a reference value.

After MVIC the participants performed their protocols (T1 and T2). For protocol T1 the subjects performed bench press without PRE first and completed the bench press with exhaustion after the rest period. For protocol T2 the subjects performed PRE of the triceps brachii and then the bench press first and completed the bench press without PRE after the rest period. All bench presses were performed at the load that was obtained in the 10RM test, therefore the weights used in the bench press was the same in both protocols. During T2 the subjects was to perform a triceps brachii extension close to the point of muscular failure immediately followed by the bench press where 1 set of as many repetitions as possible was performed at the 10RM determined weight. T2, T1 and 10RM test was performed the same day in a randomized crossover design where half of the group performed the T2 protocol first and the other half T1 first. The subjects had 10 to 15 minutes' rest between the two different protocols

2.4 Ethical and social consideration

All the participants were informed about the study and what was to be expected from them, they read and signed an informed consent containing all the information necessary to make the decision whether to join the study or not (Appendix 1). The participants had the opportunity to withdraw from the study any time with no questions asked according to the Declaration of Helsinki, (2013).

It can be important for training science to have more information on PRE to be able to use this training method in a way where it can aid. Resistance training is beneficial and important for everybody, especially elderly to maintain muscle mass and live a healthier lifestyle. PRE can be one of many ways to do resistance training and if it can aid people and their health more research should be done.

2.5 Statistical analysis

The conditions of normality variances of the data were tested using the Shapiro-Wilks test, the test showed that the data was not normally distributed why Wilcoxon signed rank test was used to compare within group differences. Data was presented as mean and standard deviation to be able to compare the results with other studies. An alpha level of 0,05 was used. Data collection and analysis were done in SPSS 20.0 (IBM Corp. Released 2011, Version 20.0, Armonk, New York, USA).

3 Results

Pectoralis major activation was significantly higher in the subjects that pre-exhausted triceps brachii before performing the bench press (p=0.000). Triceps brachii showed no significant difference between the T2 group and the T1 group (p=0.405). Deltoid anterior activation was significantly higher in the T2 group than the T1 group during the bench press (p=0.009) (Figure 1; Table 2).

Table 2. Mean muscle activity in µV and percent of MVIC with standard deviation (SD) in T1 (exercise protocol 1 where bench press without PRE was performed first) and T2 (exercise protocol 2 where bench press with PRE was performed first).

Average activation	T1(%MVIC) (n = 30)	T2(%MVIC) (n = 30)	P-Value
Pectoralis major	45.3(±12.4)	56.4(±18.4)	0.000
Triceps brachii	56.3(±15.9)	58.5(±20.0)	0.405
Deltoid anterior	63.5(±31.4)	71.7(±42.7)	0.009

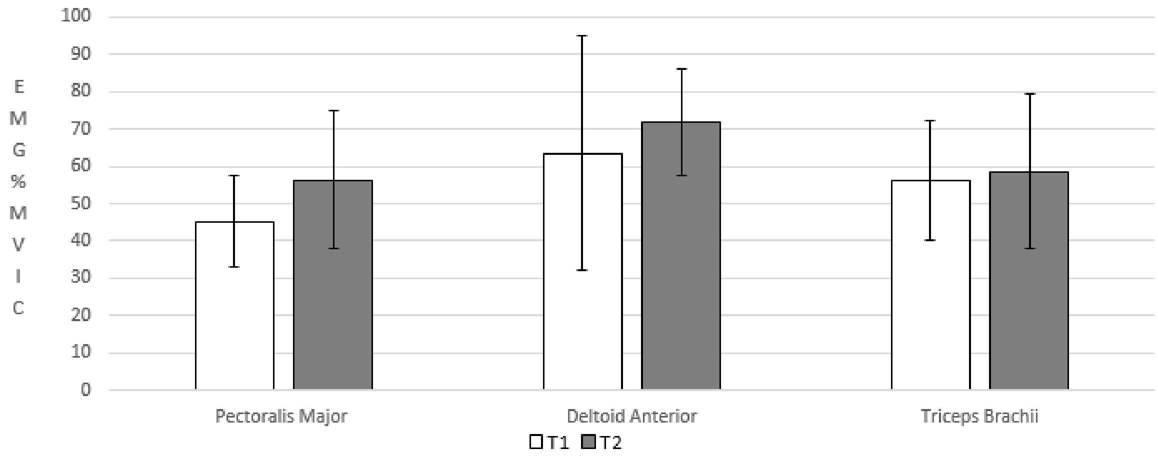

Figure 1. Comparison between performing the bench press before PRE (T1) and performing the bench press after PRE (T2) in pectoralis major, deltoid anterior and triceps brachii presented in mean and SD, n=30.

4 Discussion

4.1 Results

The purpose of this study was to investigate the effects of pre-exhausting a synergist prior to a compound exercise (bench press). The results indicate that there's a significant increase in both pectoralis major and deltoid anterior when pre-exhausting the triceps brachii muscle. These results are similar to the study done by Guarascio et al. (2016) where an increase of the muscle activity in the pectoralis major was observed when pre-exhausting triceps brachii prior to performing a bench press. These results are in line with what has been reported by other studies as well where a PRE of a primary mover has resulted in altered recruitment patterns in the measured muscles (Gentil, Olivieira, Carmo & Bottaro, 2007; Augustsson, Thomeé, Hörnstedt, Lindblom, Karlsson & Grimy, 2003).

Earlier research with similar method such as Guarascio et al. (2016) did not monitor other muscles than the pectoralis major with EMG, but in this study EMG activity was measured in the triceps brachii and deltoid anterior as well and therefore could provide more data. This new data showed that deltoid anterior has a significant increase in muscle activity, the triceps brachii activity had a small mean increase but was not statistically significant. Further research with larger populations might show different results as well due to the somewhat low number of participants in earlier studies. However, in the study performed by Brennecke et al. (2009), they observed no significant increase in EMG activity in pectoralis major and deltoid anterior but saw an increase in triceps brachii. The limits in earlier research has been the number of participants, the number of muscles of which EMG activity was measured and what muscle group they have used PRE on. Not many studies have been done where the synergist has been pre-exhausted, the agonist has been more common to use PRE on. This has resulted in studies similar to this one but with factors that are different and therefore the results are not comparable to all previous mentioned studies. The most similar one is Guarascio et al. (2016), which lacks EMG data from the triceps brachii and deltoid anterior.

According to Konrad (2006) a 40-60% value of the maximum voluntary contraction is needed to gain strength from resistance training. Since PRE can increase the EMG activity of muscle groups compared to non PRE-training it is possible that this method can be used to target specific muscles that would not reach a significant % of MVIC without PRE. Therefore further research is needed to recognize the true potential of this training method.

4.2 Method

In this study surface EMG was used to measure the muscular response during the bench press. Surface EMG has similar reliability and similar validity as the intramuscular EMG (Kuriki, Azevedeo, Takahashi, Mello, Filho & Alves, 2012; Marshall & Murpy, 2003). The electrodes were placed according to Konrad (2006). hence the reference electrode on both pectoralis major and triceps brachii were not placed on a bony structure, this can cause cross-talk and disturb the EMG signals and cause misleading results. While performing MVICs we used two different exercises in the beginning of the study but we noticed that the bench press exercise expressed the largest results for all three muscles. This caused us to switch from a separate MVIC exercise for the triceps brachii and use only the bench press. Removing one exercise did not affect the data collected since we used the highest MVIC values regardless of exercise choice. Some subjects also orally expressed that it was hard to push the weight with all their force since muscles and joints would start to ache during the MVIC. A solution to this might be to let the subjects perform a more excessive warm up before the MVIC testing.

Previous studies such as Guarascio et al., (2016) performed the tests on separate days whereas this study did both tests on the same day. This might have both positive and negative aspects. The positive is that the EMG electrodes were on the exact same location during both tests and the testing surroundings did not change. The negative aspect is that the subjects might be tired after the first test even though the resting time should be efficient (Salles et al., (2009).

Even though we had inclusion criteria for the subjects to be able to participate in the study those parameters might be able to get adjusted to find better subjects for a similar study. The author of this thesis suggests looking at both the time the subjects have performed the bench press but also how strong they are since the difference in how much effort people put into the exercise will affect their results and setting up inclusion criteria that involves those parameters. Setting up a relative strength limit might get a more homogenous population and show other results.

5 Conclusion

This study has showed that pre-exhausting a synergist (triceps brachii) prior to a compound exercise (bench press) can change the muscle activity in the involved muscles. These findings suggest that PRE is a reliable way to change the way your muscles work during an exercise. This can be used by athletes who are looking to make specific improvements in certain muscles but are having a hard time to activate the muscle they want to in certain types of exercises. Further research is needed in the area, and research on more advanced athletes (strength requirement inclusion criteria) with competitive bench press experience to see whether the muscle activity changes with more skill in the exercise.

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Appendix 1

Informationsbrev till deltagare

Bakgrund och syfte

Den här studien utförs som en del av ett examensarbete av studenter på Högskolan i Halmstad. Syftet med studien är att kolla på om det blir någon skillnad i muskelaktivitet i stora bröstmuskeln, triceps och deltoideus främre del vid vanlig bänkpress jämfört med bänkpress där man för-uttröttar triceps innan. Muskelaktivitet kommer att mätas med elektromyografi (EMG), vilket innebär att elektroder klistras fast på de aktuella musklerna för att registrera de elektriska signaler som muskeln skickar vid muskelaktivitet. Vi vill även se om det skiljer sig aktivitetsmässigt mellan män och kvinnor. Det är intressant både för samhället och för varje enskild individ att veta hur olika muskler reagera i olika situationer och hos olika individer med olika förutsättningar.
Vi kommer annonsera efter frivilliga som vill ställa upp i studien på Idrottscentrum, Crossfit Halmstad och på olika platser på Högskolan i Halmstad. För att få delta i studien måste du styrketräna regelbundet minst tre gånger i veckan varav ett pass i månaden måste inkludera bänkpress. Du ska också vara mellan 18 och 30 år och vara skadefri i överkroppen.

Hur går studien till?

Du kommer få skriva på ett informerat samtycke till att delta i studien och ges information om att du när som helst kan avsluta ditt deltagande. Du kommer att bli vägd, mätt och få genomgå en analys av kroppssammansättning med hjälp av bioelektrisk impedans (BIA), vilket innebär att man helt smärtfritt ställer sig i underkläder på själva ”vågen” och håller i två metallhandtag med utsträckta armar en bit ifrån kroppen längs med sidorna. Vid samma tillfälle kommer du bli testad på hur många repetitioner du kan utföra 10 strikta repetitioner i bänkpress.
Vid själva testtillfället som beräknas att utföras en vecka senare kommer du bli uppkopplad med EMG-elektroder för att muskelaktiveringen ska kunna mätas på de aktuella musklerna. Det är tre stycken ytliga elektroder som klistras fast på huden över vardera muskeln. Först kommer ett referensvärde tas fram för de tre musklerna, vilket innebär att du ska spänna

muskeln i ett statiskt läge så hårt som möjligt, för att vi ska kunna använda det värdet som 100% muskelaktivering. Sedan kommer du få utföra 10 repetitioner bänkpress på vikten som togs fram vid första tillfället, vila minst 30 minuter och sedan utföra tricepsextensioner tills triceps är helt utmattade, för att direkt efter utföra så många repetitioner bänkpress på den angivna vikten som du orkar. För vissa deltagare kommer det ske i omvänd ordning. Testresultaten kommer avidentifieras, dokumenteras och omhändertas av testledarna och behandlas konfidentiellt. Endast testledarna, Jenny Fälth och August Ahlebrand, samt deras handledare kommer ha tillgång till datan. Det är testledarna som ansvarar för datan. Efter studiens slut kommer resultaten förvaras på en USB-sticka på Högskolan i Halmstad. Skulle resultaten bli aktuella till en ny studie i framtiden kommer du kontaktas och frågas om du tillåter att resultaten återigen används i förnyat syfte. Vill du ta del av dina egna resultat kommer testledarna lämna ut dem vid förfrågan.

Finns det några risker med studien?

Huden kommer att rakas och desinficeras där elektroderna kommer placeras, vilket kan göra att huden blir lite irriterad och röd. Man kan även få lite träningsvärk efter testtillfällena. Det kommer finns ”passare” på plats vid testtillfällena för att minimera risken att du gör dig illa under bänkpressen.

Finns det några fördelar?

Ur ett hälsoperspektiv kan det vara bra att få din kroppssammansättning analyserad. Du kommer att få reda på hur stor del av kroppen som består av fett, fettfri massa, mineraler osv. Det kan även vara intressant att veta exakt vilken vikt du klarar att ta i bänkpress när du ska lägga upp ett träningsprogram.

Försäkring, ersättning

Ingen särskild försäkring kommer att tecknas för projektet. Du rekommenderas att ha en egen olycksfallsförsäkring. Deltagande sker frivilligt utan att någon ersättning kommer att betalas ut. Du kommer att erbjudas varierande tider för att hitta tider som passar dig för testerna.

Frivillighet

Deltagande i studien är helt frivilligt och kan när som helst avbrytas utan att du behöver ange orsak.

Ansvariga

Ansvariga till studien är Högskolan i Halmstad. Kontaktpersoner för projektet är Jenny Fälth, som kan nås på jenny.falth@hotmail.se eller via telefon: 073 02 41 694 och August Ahlebrand, som kan nås på august.ahlebrand@gmail.com. Handledare på högskolan är: Charlotte Olsson; charlotte.olsson@hh.se

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