

# Mechanics of the Flat Dumbbell Fly

By Tracy Anderson

This auxiliary exercise is an isolation exercise focusing on the pectoralis major, more specifically the sternal portion. While I chose to discuss this exercise, the basic biomechanics, can carry over to most other isolation movements of the chest muscles. Keep in mind, the upper arm (humerus) is the focus of the movement, not the hand or weight. The humerus will always rotate on a vertical axis in the horizontal plane. Only the degrees of abduction will differ. On a flat dumbbell fly, your humerus is at approximately 80°-90° abduction, but during incline fly your humerus may be at 120° abduction. However, the basic biomechanics remain the same.

To perform this exercise grasp two dumbbells and lie supine (face up) on a bench. Support the dumbbells above your chest with your arms fixed in a slightly bent position. Internally rotate your arm (humerus) so the backs of the elbows are facing the sides. Elevate your rib cage and push your shoulder girdle into your rib cage. Lower the dumbbells to the side until you feel a slight stretch in your chest muscles while your elbows remain fixed. Bring the dumbbells together in a hugging motion until dumbbells are nearly together. Inhale as the dumbbells descend (eccentric) and exhale as you force the dumbbells together (concentric). As you bring the dumbbells back together, stress three things: 1) push your shoulder girdle down, 2) elevate your rib cage and 3) Squeeze the chest and flare your lat muscles.

This is not an exercise in which you would use heavy weights. Your chest muscles have a weak mechanical advantage. The shoulder joint is the axis, the point of insertion of the pectoralis major is the force and the dumbbell in your hand is the resistance. This is a third class lever and is useful with range of motion movements, not power movements. Remember that the farther away the resistance is from your force, the less force can act upon the resistance. This is why cheaters bend their elbows more than they should, to move the resistance closer to the force.

The muscles involved in this exercise are the pectoralis major, sternal portion, as the prime mover. The pectoralis major, clavicular portion, anterior deltoid and the short head of the biceps act as assisting muscles, while the biceps, brachialis, brachioradialis, triceps and wrist flexors act as stabilizers. Stabilizers contract without significant movement, to stabilize the non-moving joints.

The sternal portion of the pectoralis major originates from the sternum (costal cartilage of the first six ribs) and inserts on the lateral lip of the bicipital groove on the humerus. For this exercise, this muscle functions to horizontally adduct the humerus.

The clavicular portion of the pectoralis major originates from the medial (inner) third of the clavicle (collar bone) and inserts at the same place as the sternal portion. Because of its line of pull, this portion of the pectoralis muscle does not contribute much force. However, if you were inclined, the humerus would be abducted to about 120°, and this portion would be stronger and contribute a lot more force. This is why inclined exercises build the upper chest more effectively than flat exercises.

The anterior (front) deltoid originates from the lateral (outer) third of the clavicle and insert onto the deltoid tuberosity of the humerus. This muscle functions as a prime mover in this plane of motion, and is the reason for depressing the shoulder girdle. By depressing the shoulder

girdle, you will limit the movement of the scapula and minimize the amount of force contributed by the anterior deltoid. The next time you do fly's, try to do them while your shoulders are shrugged and you will feel the movement in the shoulder muscles.

The short head of the biceps brachii originates from the coracoid process of the scapula and inserts on the radial tuberosity of the radius. The coracoid process is a tiny bony projection on the anterior (front) surface of the shoulder joint. It is actually the most anterior portion of the scapula. Because of its attachment and line of pull, the short head contributes only a small amount of force.

The long head of the biceps originates from the supraglenoid tubercle of the scapula and because of its poor line of pull, it has no effect on the actual force moving the dumbbell, but does contribute a stabilizing effect on the shoulder. The triceps brachii muscle, because it crosses the posterior portion of the shoulder joint, works in conjunction with the biceps muscle, to stabilize the shoulder joint. Both, the biceps and triceps, also act to stabilize the elbow joint, along with the brachialis and brachioradialis. The wrist flexors stabilize the hand and wrist and hold the dumbbell in place.

You could also consider the serratus anterior, pectoralis minor and the back muscles, because they act as neutralizers. A neutralizer muscle prevents unwanted movement, because a muscle knows no direction when it contracts. With this exercise we want to minimize, or neutralize, movement of the scapula. Thus, since these muscles act to depress the scapula and shoulder girdle, they must also be mentioned.

This article is excerpted from Tracy Anderson's book *Movement Science for Personal Trainers*. Questions and comments are welcomed and can be given at [www.LFNOnline.com](http://www.LFNOnline.com).