
Dr. Larry VanSuch's
BASEBALL SWING MECHANICS
Wrists Cocked
Shoulder Stretched
Spine Rotated
Hips Opening
Leg Pushing
Timing Step
Identifying the movements and muscles of the baseball swing for exceptional hitting!

Dr. Larry VanSuch's

BASEBALL SWING MECHANICS

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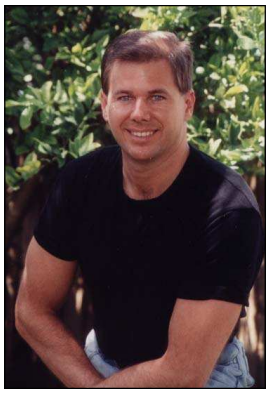


Dr. Larry Van Such, DC, BE

Dear Athlete,

Thank you for your interest in the *Baseball Swing Mechanics* book. It is my sincere desire that the information presented here meets your needs.

Identifying the movements and muscles in the baseball swing is a very interesting and detailed process. As you will soon discover in this book, there are many muscles in the hips, legs, spine, shoulders, arms and hands that are involved in correctly swinging the bat.

Once you learn the major movements in the swing, the muscles associated with these movements and the specific roles they play, you will be able to develop a more focused exercise training program that will improve your bat speed and power.

So take the first step and start learning the mechanics of the swing and which muscles are involved in the loading phase, launching phase and follow through.

Sincerely,

Dr. Larry Van Such, DC, BE

Chapter 1

The Stance

The baseball swing consists of three main phases: 1) the loading phase, 2) the launching phase and 3) the follow through.

Each player has their own unique style and may sometimes make adjustments to their swing depending on the game situation, the type of pitch, or other factors. However, regardless of the batting style used and the adjustments made to it, the muscles involved in the baseball swing always remains the same.

In this book, we are going to identify all of the major movements and muscles used in each phase of a typical swing for the right-hand batter. Once you learn these movements and the muscles involved in performing them, you will become a more focused, confident and productive hitter.

However, before any of these phases are performed, getting into the proper stance is required. Therefore, let's first identify the basic stance position along with a few variations to it for the right-hand batter.

The baseball swing begins with getting into the proper stance and the feet and hand positions vary from player to player more than anything else. In Figure 1-1, the batter has chosen to stand with his feet a little more than shoulder width apart.

Figure 1-1.

A firm grip of the bat is usually preferred and the height of the hands, as well as a distance they are in front of the body, is based on preference. Figure 1-2 on the next page shows the hands about 10 to 12 inches in front of the body and right about shoulder level.

Figure 1-2.

Some players may prefer to keep the hands in closer and perhaps lower or higher. Figure 1-3a shows the player's weight is balanced and evenly distributed between his two feet while Figure 1-3b shows him standing fairly tall in a box. Figure 1-3b also shows that he is leaning slightly forward with his knees and hips slightly flexed and Figure 1-3c shows him totally focused on the pitcher.

Figure 1-3a.

Figure 1-3b

Figure 1-3c

The shoulders and hips are level in the stance position for most players, but this too may vary slightly.

The stance is truly a matter of personal preference. As long as it fits your own individual style and it helps you to feel comfortable, confident and alert in the box, you are ready to swing the bat.

Chapter 2

The Loading Phase

The loading phase takes us from the *stance position* to the *launching position* and it consist of five noticeable movements: 1) the backward movement of the shoulders and arms, 2) the backward rotation of the spine, 3) the beginning of the timing step, 4) the cocking of the hips, and 5) the cocking of the wrists.

In this chapter we will define each of these movements in great detail as well as identify all of the muscles involved in performing them.

1) THE BACKWARD MOVEMENT OF THE SHOULDERS AND ARMS

The first noticeable movement that takes place during the loading phase is the *backward movement of the shoulders and arms* toward the catcher. This action helps to load or stretch different muscles in each shoulder that will be released or contracted later during the swing.

In Figures 2-1a through 2-1c, we see both shoulders and arms moving in the same direction, back and away from the pitcher, however, each shoulder uses a different set of muscles to get there.

Figure 2-1a.

Figure 2-1b.

Figure 2-1c.

Now, before we identify the muscles involved with these movements, I want to clarify something for you here. This movement seen in Figures 2-1a through 2-1c, with the arms and shoulders moving back toward the catcher, is often referred to as *rotation of the arms* or *rotation of the shoulders* however, this actual terminology is not anatomically correct.

And the reason why I want to bring this up to you here is because if you go to a personal trainer or strength coach who may not be familiar with the baseball swing, and you ask them to show you some exercises to help you strengthen the rotational movement of your arms or shoulders, what they are going to think that you are asking them to do is to show you exercises to help you throw a ball harder and faster (see Figure 2-2a on the next page), and not swing the bat harder and faster, (see Figure 2-2b on the next page).

Figure 2-2a.

Figure 2-2b.

And that's because anatomically, Figures 2-3a and 2-3b below demonstrate external shoulder rotation, or external arm rotation, and Figures 2-4a and 2-4b demonstrate internal shoulder rotation or internal arm rotation.

Figure 2-3a. Neutral Shoulder Position.

Figure 2-3b. External Shoulder Rotation.

Figure 2-4a. Neutral Shoulder Position.

Figure 2-4b. Internal Shoulder Rotation.

Now compare Figure 2-3b and Figure 2-4b with Figure 2-5 below, which does not involve any rotation of the arms at the shoulder joint, and you should be able to see the difference.

Figure 2-5. No Shoulder Rotation.

And so this is the reason why I have chosen to identify this first step in the loading phase as the *backward movement of the shoulders and arms* because as you are going to see here in a minute, neither shoulder or arm is actually rotating and in fact, each shoulder and arm is being moved by a completely different set of muscles.

Okay, so with this is mind, let's first take a look at the players left arm and shoulder. As he prepares to load his body, by going from the stance position to the launching position, the left arm and shoulder is moved backward and away from the pitcher and the correct name for this movement is adduction of the shoulder or adduction of the arm. See Figure 2-6.

Figure 2-6. Adduction of the left shoulder or arm.

This movement is caused primarily by the action of the Pectoralis Major and is also assisted by the Coracobrachialis, Latissimus Dorsi, and Teres Major muscles, all on the left side of the body. See Figure 2-7.

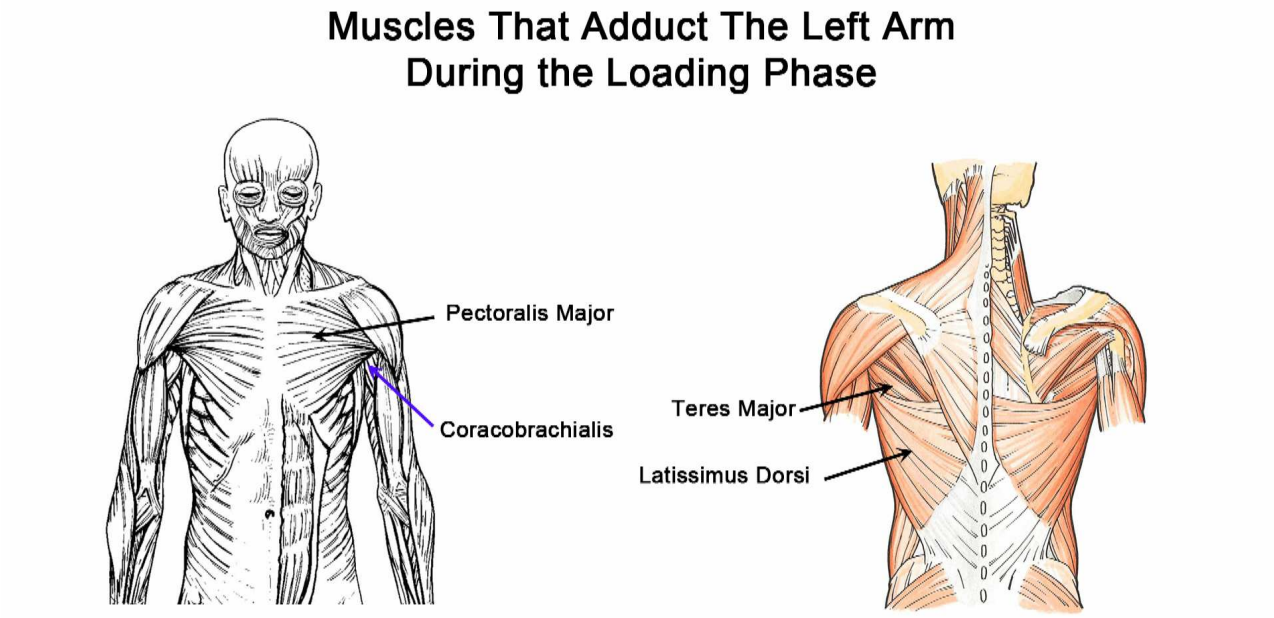


Figure 2-7.

Now, the left shoulder ends up slightly shrugged in this position (See Figure 2-6 on previous page) which is a function of the Upper Fibers of the Trapezius. The left scapula, or shoulder blade, is also protracted, or moved anterior toward the front of the body, in this position. This motion is caused by the left Serratus Anterior. See Figure 2-8 for both of these muscles.

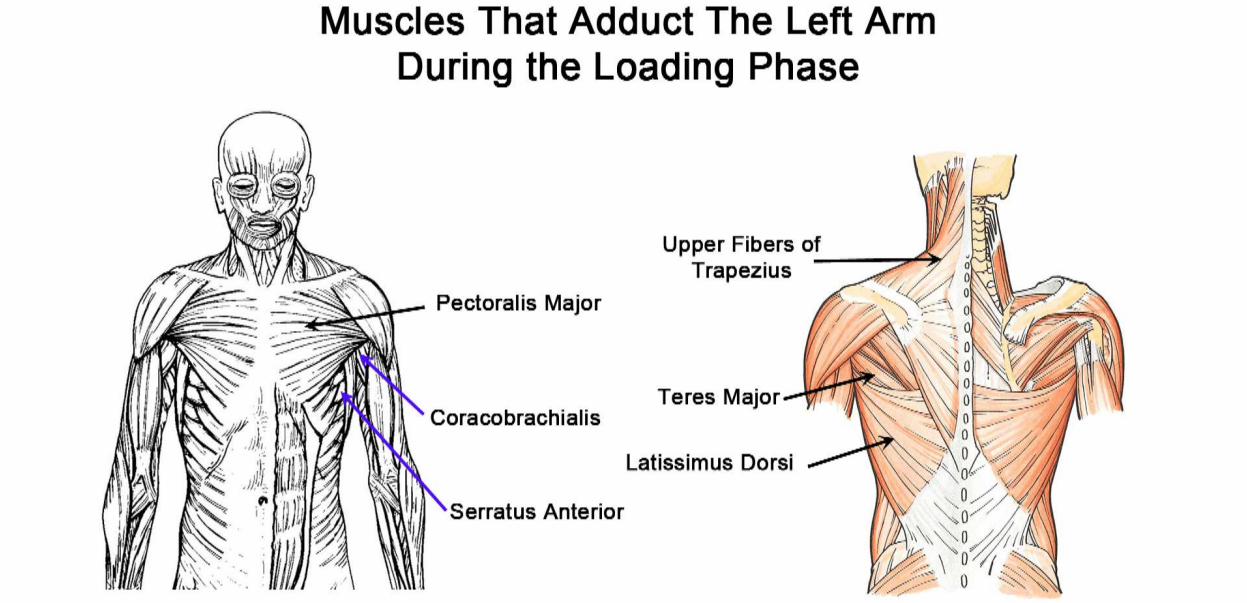


Figure 2-8.

Now, the contraction of these muscles stretches, or loads, the muscles on the back of this same leading left shoulder, namely the Posterior Deltoid, Rhomboids and Middle Fibers of the Trapezius and because the left arm is so severely adducted across the player's body, two of the rotator cuff muscles are also undergoing a stretch and those are the Teres Minor and Infraspinatus. See Figure 2-9.

Figure 2-9.

All of these muscles are now fully loaded or stretched and ready to swing forward in this position and can be seen in more anatomical detail in this Figure 2-10 on the next page.

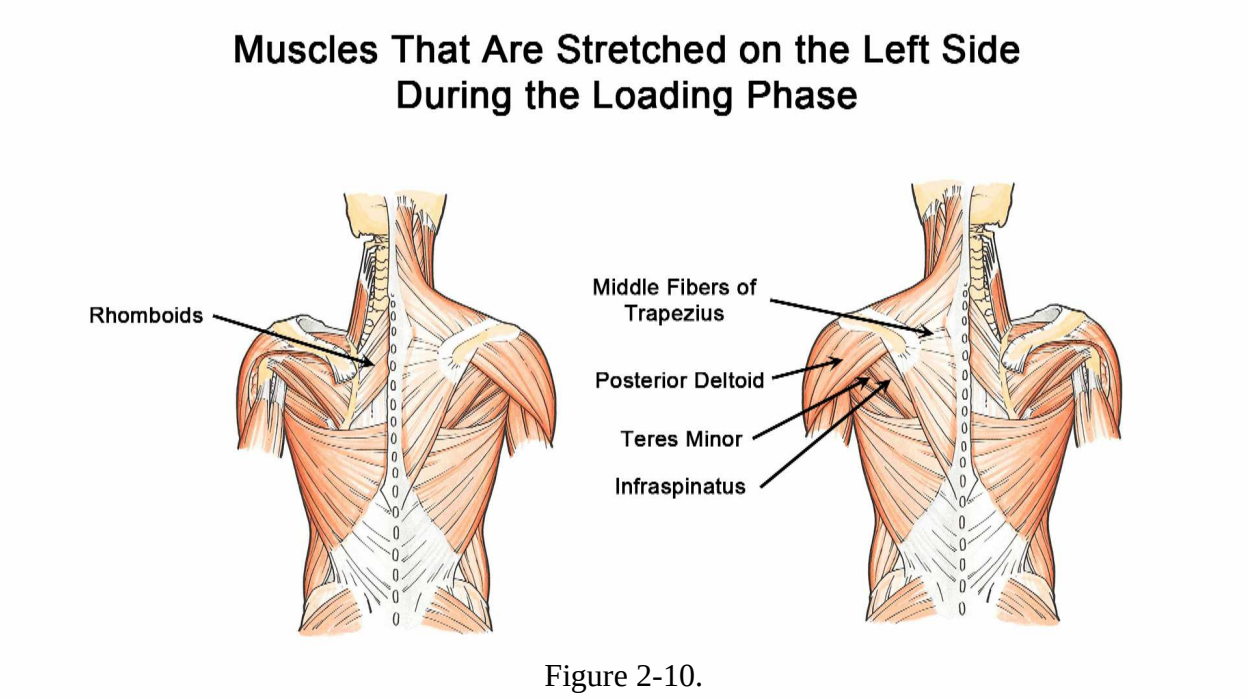


Figure 2-10.

Now let's take a look at the back arm, or right arm. The movement of the back arm away from the pitcher and laterally raised away from the player's body is known as shoulder abduction. See Figure 2-11.

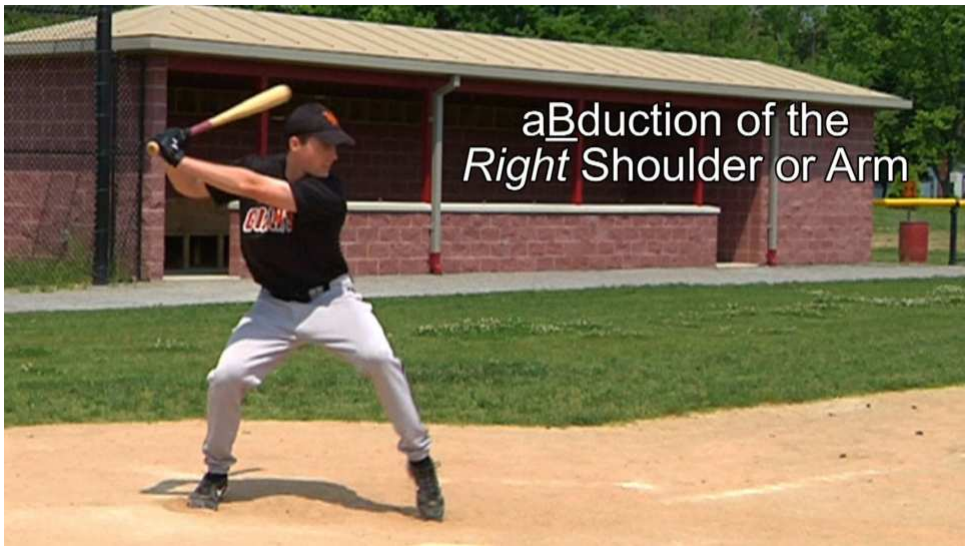


Figure 2-11.

This action is caused by the Supraspinatus and Middle Deltoid muscles. The right scapula may also be slightly shrugged or elevated in this position depending on the player's style and if so, this motion caused by the Upper Fibers of the Trapezius. See Figure 2-12 on the next page.

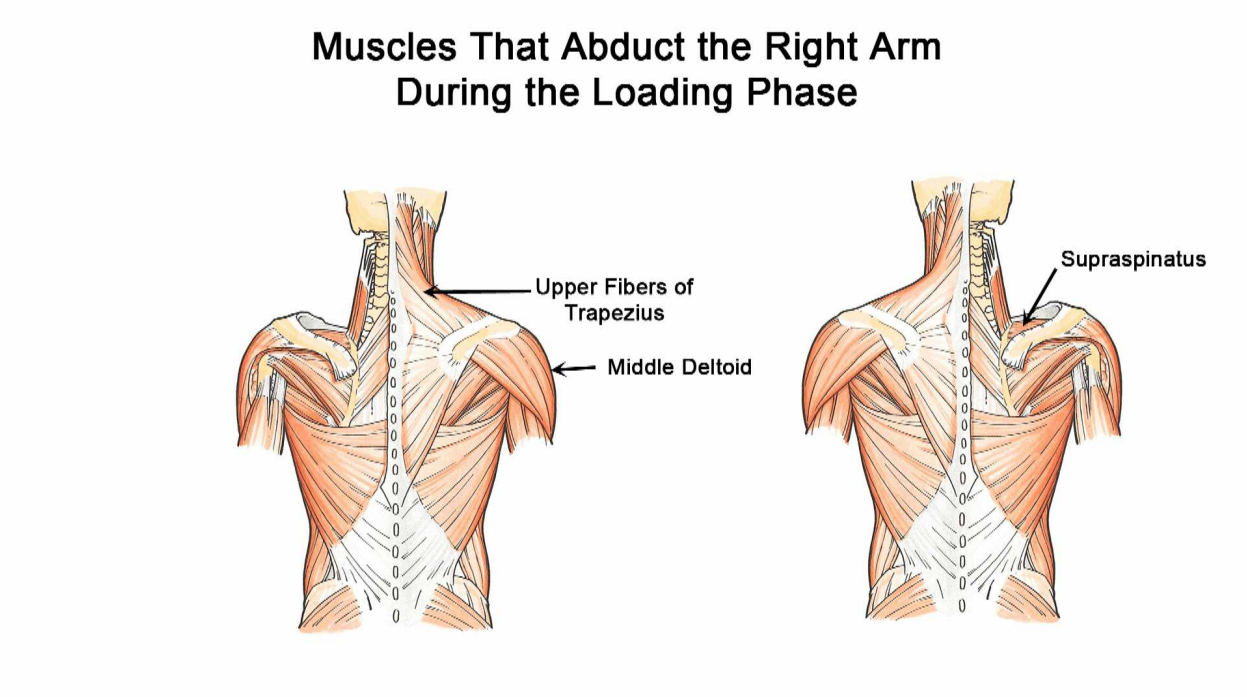


Figure 2-12.

Now the contraction of these muscles stretches or loads the antagonistic, or opposing, muscles on the same side of the body namely the Latissimus Dorsi, Teres Major, Serratus Anterior and Pectoralis Major. These muscles are now fully loaded and stretched, ready to help swing the bat from this position and can be seen more clearly in Figure 2-13.

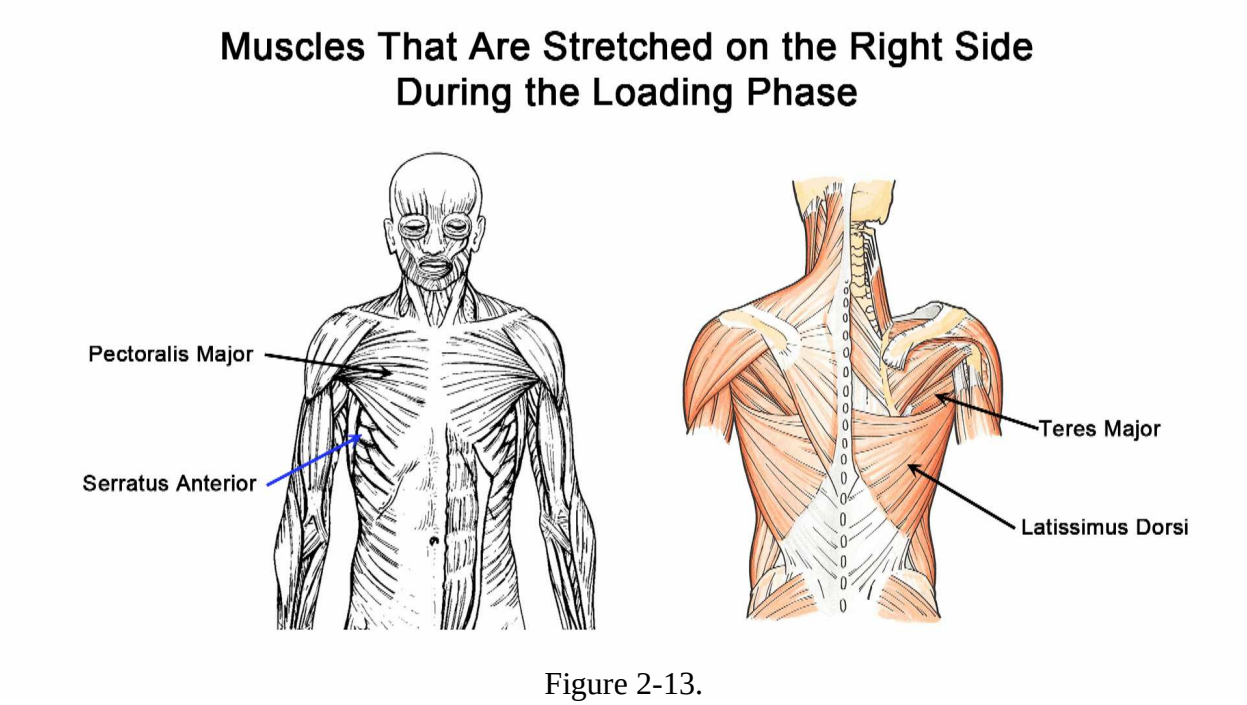


Figure 2-13.

In the next section we will talk about the second noticeable movement during the loading phase which is, the *backward rotation of the spine,* and identify the muscles involved with it.

2) THE BACKWARD ROTATION OF THE SPINE

Picking up where we left off in the last section, where the shoulders and arms were moving backward, we also have at the same time muscles contracting along the spine to help turn and rotate it, which includes the chest, abdomen and upper body, in the same direction. See Figures 2-14a through 2-14c.

Figure 2-14a.

Figure 2-14b.

Figure 2-14c.

Let's look at this from behind home plate. Starting in this stance position (Figure 2-15a) where only the back (right) shoulder is visible, as he prepares to swing we can start to see the chest, abdomen and upper body turning away from the pitcher (Figure 2-15b) to the point where both shoulders become more visible (Figure 2-15c).

Figure 2-15a.

Figure 2-15b.

Figure 2-15c.

This action of the abdomen, chest and upper body all turning away from the pitcher and toward the catcher gives the appearance that the shoulders are rotating backward with them when in effect, it is the spine that is rotating carrying the shoulders with it.

This backward rotation of the spine is caused by the contraction of the Lateral Spine Rotators which is a general name for the muscles that cause spine rotation. Their individual names are External Abdominal Oblique, Rotatores Spinae and Multifidus Spinae. See Figure 2-16.

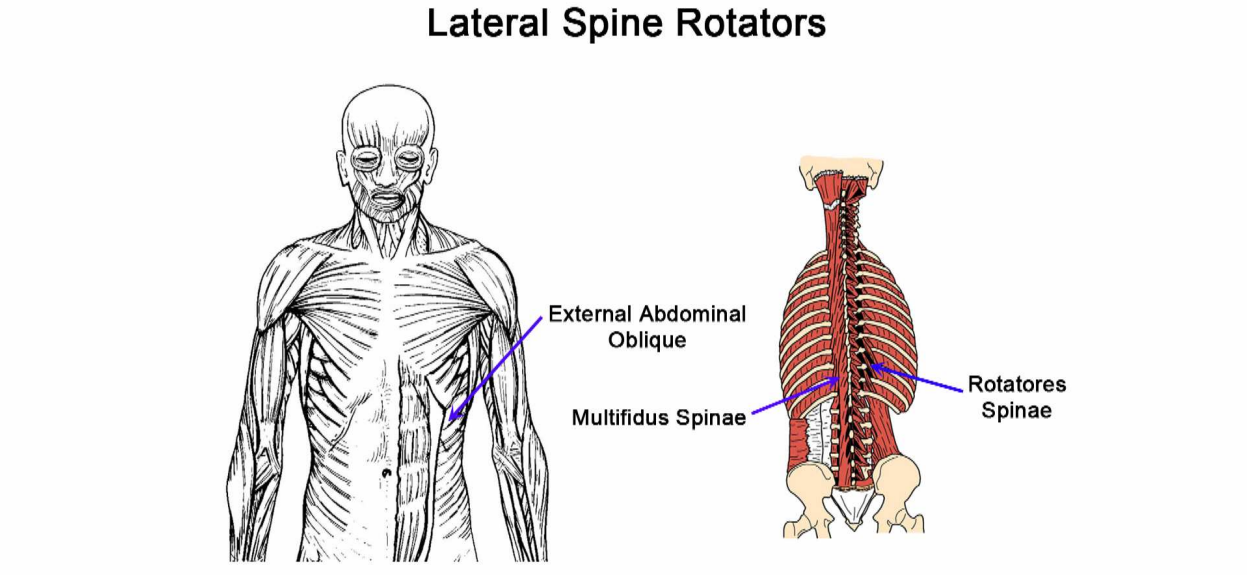


Figure 2-16.

Now, to get the body to rotate back and away from the pitcher for our right-handed batter, the Lateral Spine Rotators on the *left side* of the body needs to contract. In doing so the upper body is turned to the side *opposite* to that from which these muscles act. See Figure 2-17.

Figure 2-17.

This may be opposite of what you think however, this has to do with the upward and oblique orientation of these muscles in the spine. To help you get a clearer picture of how these muscles are acting, just think about the movement that takes place when you do oblique sit up crunches.

In Figure 2-18 shown on the next page, the athlete has already performed a sit-up and has rotated his chest, abdomen and upper body to his right. However, it is the Lateral Spine Rotators on the *left side of his body* that are doing the contracting here which is also in the same direction for our right-handed player shown above in Figure 2-17.

Figure 2-18.

And if you have ever performed these sit-ups before, then you are already aware of where the muscle contractions are taking place. Again, contraction of the Lateral Spine Rotators on the *left side of the body* turns the front of your body to the right as seen above in Figure 2-18, and the opposite is true for the Lateral Spine Rotators on the *right side of the body* which turns the front of your body to the left as seen below in Figure 2-19.

Figure 2-19.

Okay, so hopefully you have a better understanding of how these muscles are acting because as the contraction takes place in the Lateral Spine Rotators on the *left side of the b*ody, as seen below in Figures 2-20a through 2-20d for the right-handed batter, the exact same muscles on the opposite side of the body are getting *stretched*, which are the Lateral Spine Rotators on the *right side*. These Lateral Spine Rotators *on the right side* are now ready to contract in the launching phase of the baseball swing because they are now fully stretched or loaded.

Figure 2-20a.

Figure 2-20b.

Figure 2-20c

Figure 2-20d.

In the next section we will discuss the third noticeable movement during the loading phase which is, the *beginning of the timing step*, and identify the muscles involved with it.

3) THE BEGINNING OF THE TIMING STEP

Immediately after the spine begins to rotate back toward the catcher, a short timing step with the front left leg begins to occur as seen from across home plate in Figure 2-21.

Figure 2-21.

In Figure 2-21 above, we see that as the player's body has turned back and away from the pitcher, his left foot has come off the ground signifying the beginning of this timing step. Some players may raise their foot higher than this while others may still keep their toes in contact with the ground.

Some will even get to turn their front thigh inward a little more to facilitate the cocking of the hips which we will talk more about in the next section. See yellow arrow in Figure 2-22. This inward turning of the front thigh is usually a technique used by the big league hitters but as you can see in the figure below, this is not a part of our batter's technique here.

Figure 2-22.

But however high or low the timing step is, the first effect of it is to force the back leg, the leg closest to the catcher, to carry the player's weight also seen above in Figure 2-22.

And since his center of gravity remains in relatively the same place during this process, which for the most part is still along the midline of his body, and perhaps more importantly, in front of his back foot as seen in Figure 2-23a below, the natural tendency once is this position, will be to fall forward, thereby creating valuable momentum in the process during the launching phase. See Figure 2-23b.

Figure 2-23a.

Figure 2-23b.

Another effect of the *beginning of the timing step* is that it also places additional load on the big muscles of the back leg, thigh and buttocks. Compare the stance position in Figure 2-24a with that of 2-24b and you can see this additional load develop in the back leg as the player's position ends up squatted down a little more when the front foot comes off the ground.

Figure 2-24a.

Figure 2-24b.

The first group of muscles that gets further loaded during this movement are the hip extensor muscles which consist of the Gluteus Maximus, Semimembranosus, Semitendinosus and the Long Head of the Biceps Femoris. The location of where these muscles act can be seen by the yellow line in Figure 2-25.

Figure 2-25.

The hip extensor muscles can be seen more specifically in Figure 2-26.

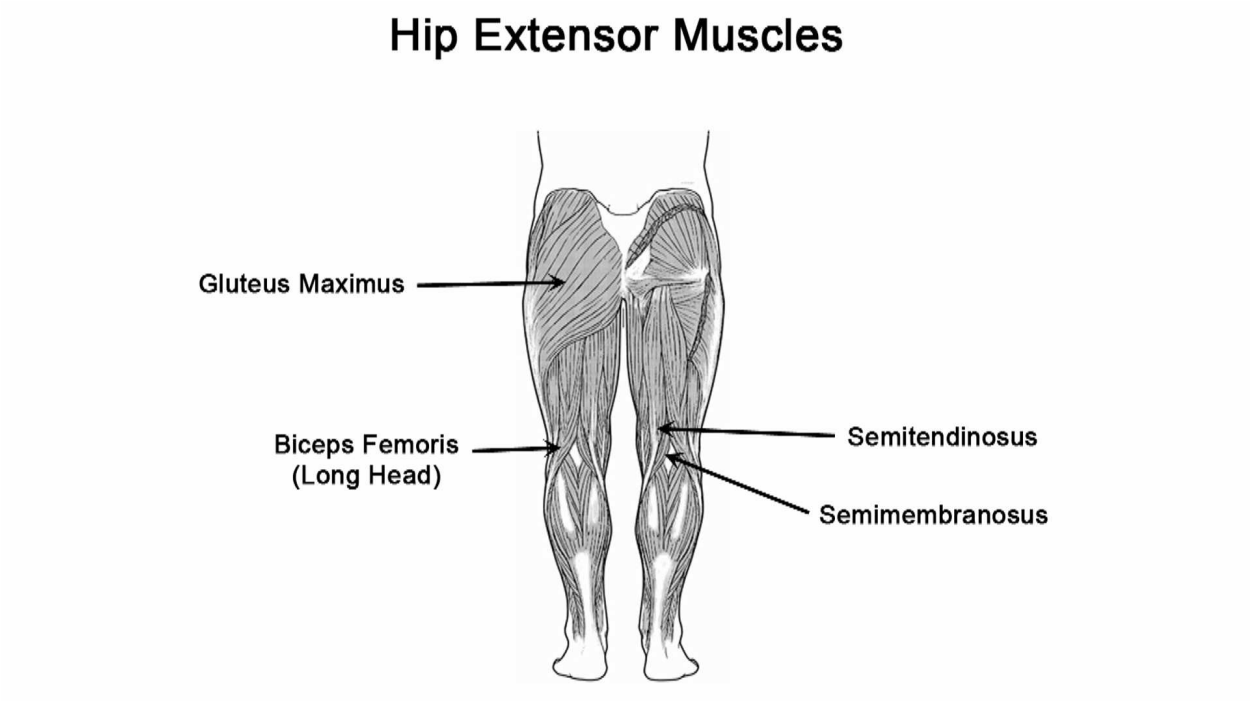


Figure 2-26.

The knee extensor muscles are loaded as well in this position and that includes the Quadriceps muscle. The location of where this muscle acts can be seen by the yellow line in Figure 2-27.

Figure 2-27.

The knee extensors can be seen more specifically in Figure 2-28.

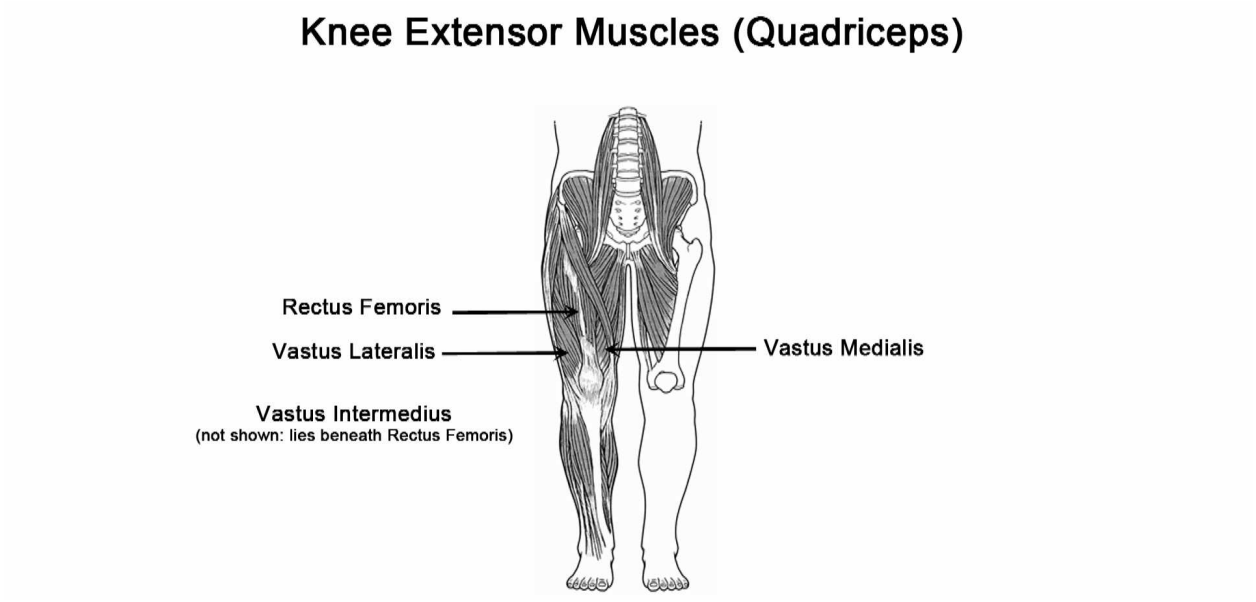


Figure 2-28.

The last muscle group that is being loaded here are the Ankle Plantar-flexors, or calf, muscles which include the Gastrocnemius and Soleus muscles. The location of where these muscles act can be seen by the yellow line in Figure 2-29.

Figure 2-29.

These muscles can also be seen more specifically in Figure 2-30.

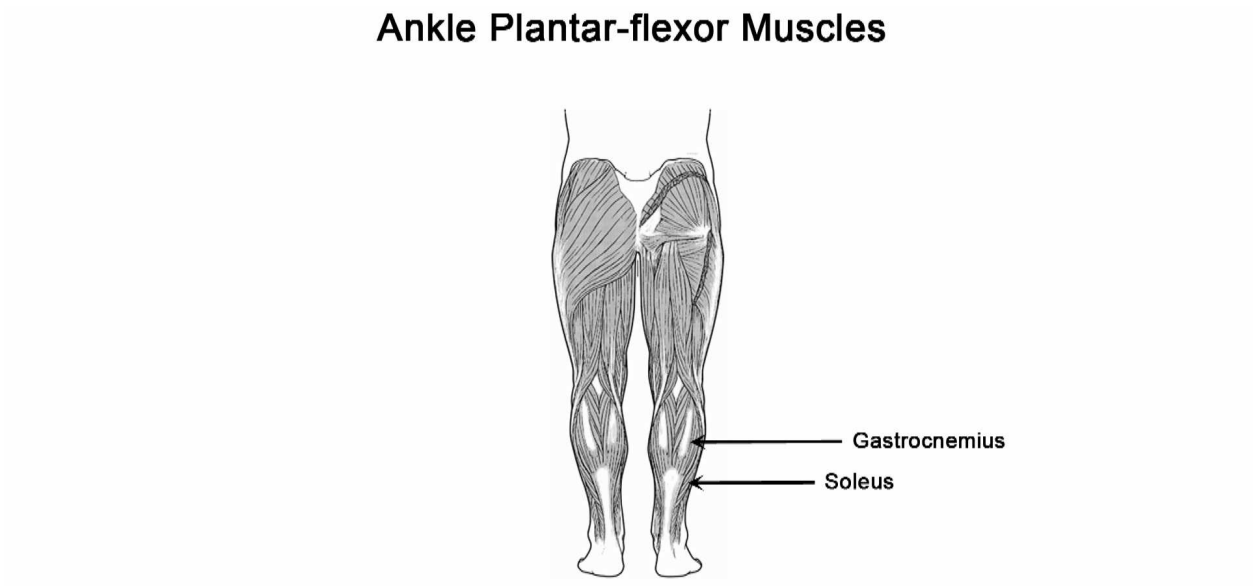


Figure 2-30.

Now besides creating momentum and loading the powerful muscles of the back leg, another purpose of the timing step is to *cock the hips* which will be the topic of the next section.

4) THE COCKING OF THE HIPS

Cocking of the hips refers to the backward rotation of the hips away from the pitcher and toward the catcher, and as just mentioned in the previous section regarding the *beginning of the timing step*, it occurs right along with it.

Now looking from behind home plate in Figure 2-31a, we can see this backward rotation of the hips develop. As the front leg comes off the ground both hips rotate backward, toward the catcher, and now the front side of both hips are visible as seen in Figure 2-31b.

Figure 2-31a.

Figure 2-31b.

Now looking from across home plate we can see that the cocking of the hips is driven by the momentum created by the backward movement of the shoulders and arms, the backward rotation of the spine, and a shift in weight to the back leg. See Figures 2-32a and 2-32b.

Figure 2-32a.

Figure 2-32b.

The cocking of the hips can also be further facilitated by the inward turn of the front left thigh, though again, that's not part of our batters technique here. See yellow arrow in Figure 2-33.

Figure 2-33.

Now since the back (right) foot remains in contact with the ground during this time, it is forced to plant firm. This creates a pivot point around the back (right) hip (Figure 2-34a) for the weight of the entire upper body to rotate (Figure 2-34b). As a result, the rear thigh is forced anatomically into medial or inward rotation. See Figure 2-34c.

Figure 2-34a.

Figure 2-34b.

Figure 2-34c.

Now this is a small movement and may not be readily observable in these images, but as the right thigh resists the upper body from any further backward rotation, the net result is that it stretches the powerful external hip rotators in this same rear hip. See Figure 2-35 on the next page.

Figure 2-35.

These external hip rotators are located in the buttocks region on the back side of your body and if we take a look down the third base line seen in these next few images, we can start to appreciate their purpose a little more.

As the player rotates back and away from the pitcher and his weight ends up on the back leg, the external hip rotators located where the yellow arrows are in Figure 2-36a get stretched in the process as seen by the displaced yellow arrows in Figure 2-36b.

Figure 2-36a.

Figure 2-36b.

This stretching puts them in the best position to powerfully contract during the launching phase. Now the names of these external hip rotators are Gluteus Medius, Gluteus Maximus, Superior Gemellus, Inferior Gemellus, Piriformis, Obturator Internus, Obturator Externus and Quadratus Femoris. They can be seen more specifically in Figure 2-37 on the next page.

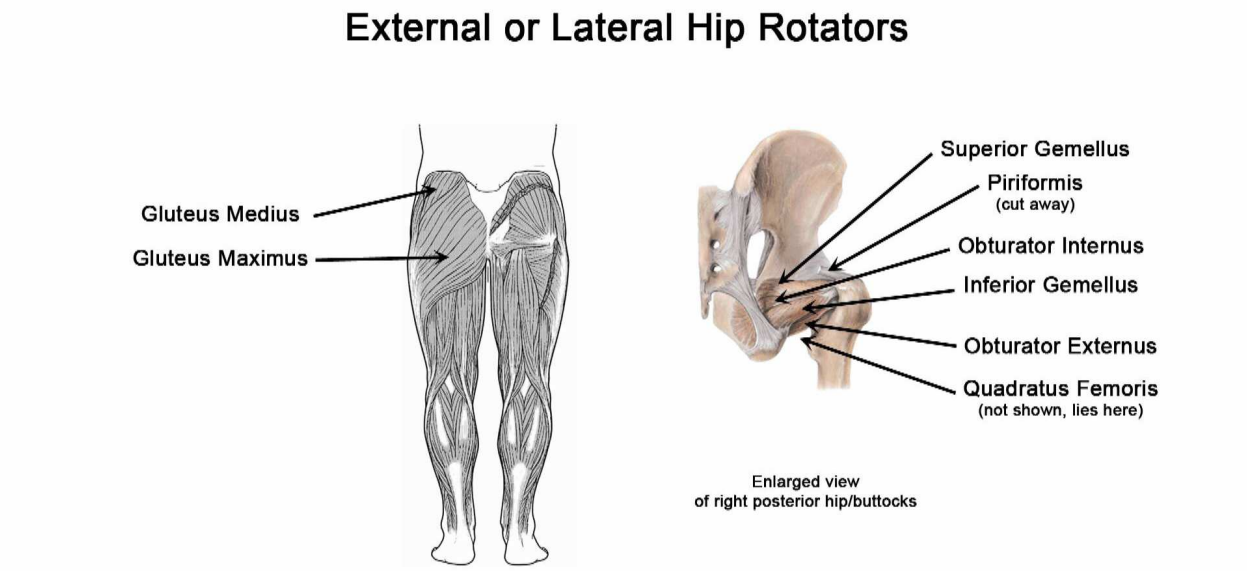


Figure 2-37.

Again, if we focus on the right hip and buttocks in the progression of images shown in Figures 2-38a through 2-38c, we can start to visualize the stretching of these external hip rotators.

Figure 2-38a.

Figure 2-38b.

Figure 2-38c.

The stretching of these muscles is the primary effect of cocking the hips, it's what its all about. Some of these muscles, as you have just seen like the Obturator Internus and Obturator Externus, are not very big, yet as a group they are super strong muscles that can store an incredible amount of elastic energy that when timed properly, can be released or contracted during the launching phase to help carry out a very powerful rotational bat swing. See Figures 2-39a through 2-39c on the next page.

Figure 2-39b.

Figure 2-39b.

Figure 2-39c.

And one final note here, this cocking of the hips is really exaggerated by the big league hitters. Some of them can really rotate a lot further back toward the catcher than our athlete seen here and some actually take a stance that favors this positioning. The reason is simple: the further they can get their body to turn away from the pitcher, the greater the stretch that occurs in these muscles and the greater the stretch, the more power they can generate. This is why these are the muscles everyone needs to target as part of their training to swing the bat harder and faster!

In the next section we will talk about the fifth and last noticeable movement during the loading phase which is. the *cocking of the wrists*, and identify the muscles involved with it.

5) THE COCKING OF THE WRISTS

Cocking of the wrists is an action the hands perform on the bat-handle at the very end of the loading phase and into the first part of the launching phase. It's purpose is to break inertia, or prevent the bat from coming to a dead stop, so as to facilitate a rapid recoiling effect with the bat-head at the end of the player's furthest backswing.

Now up until this point of the swing, the wrists and hands have not produced any significant action on the bat-handle, and subsequently the bat-head, other than holding the bat in a steady and firm position. But the batter's body and hand positions shown in Figure 2-40 is an important reference point because this is where the action of the hands and wrists begin to take effect on the bat handle. Or in other words, this is where the *cocking of the wrists begins*.

Figure 2-40.

Now as I just mentioned earlier, the purpose of the cocking of the wrists is to break inertia, or prevent the bat from coming to a dead stop, so as to facilitate a rapid recoiling effect with the bat-head at the end of the player's furthest backswing. So, let's define our next reference point, and that is, the player's further backswing.

As we watch the swing develop in Figures 2-41a through 2-41d we can now see that the player's *furthest backswing* ends in Figure 2-41d.

Figure 2-41a.

Figure 2-41b.

Figure 2-41c.

Figure 2-41d.

The *furthest backswing* position is simply a point in the swing where the head of the bat does not travel any further away in the *opposite direction of the intended path of the swing*. It also represents the position where the cocking of the wrists ends or where the wrists are fully cocked.

So to recap here a bit, let's again focus on these two bat-head positions side by side. Notice the position of the bat-head in Figure 2-42a where the *cocking of the wrists begins*, and now notice the position of the bat-head in Figure 2-42b where the *cocking of the wrists ends*.

Figure 2-42a. Beginning of wrist cock.

Figure 2-42b. End of wrist cock.

Now that we have seen the two different bat-head positions that define the starting and ending positions where cocking the wrists takes place, let's take a closer look at the action that the hands and wrists have on the bat-handle that makes this happen.

We will focus our attention first on the player's *right* hand shown again in Figures 2-43a through 2-43d. The main action that the right hand and wrist are performing on the bat handle during this movement is called *pronation*, which interestingly enough, occurs through muscles acting in the forearm near the right elbow and wrist. And so the correct name for this movement seen in the right hand and wrist is called *elbow pronation*.

Figure 2-43a.

Figure 2-43b.

Figure 2-43c.

Figure 2-43d.

It is by pronating the right elbow where the right hand and wrist turn so that the palm of the right hand starts to turn inward toward the ground and this helps to push the bat-head to its furthest backswing position. See Figure 2-44.

Figure 2-44.

Now keep in mind that this is a relatively small movement taking place in comparison to what the shoulders and upper arms are going through and so you may not pick up on it the first time by simply looking at the right hand and wrist. However, there is just enough of this pronation taking place in the right elbow to cause the right hand and wrist to turn so that the palm of the right hand starts to turn in toward the batter and this helps to push the bat-head to its furthest backswing position.

The muscles involved with elbow or forearm pronation are the Pronator Teres and Pronator Quadratus. See Figure 2-45.

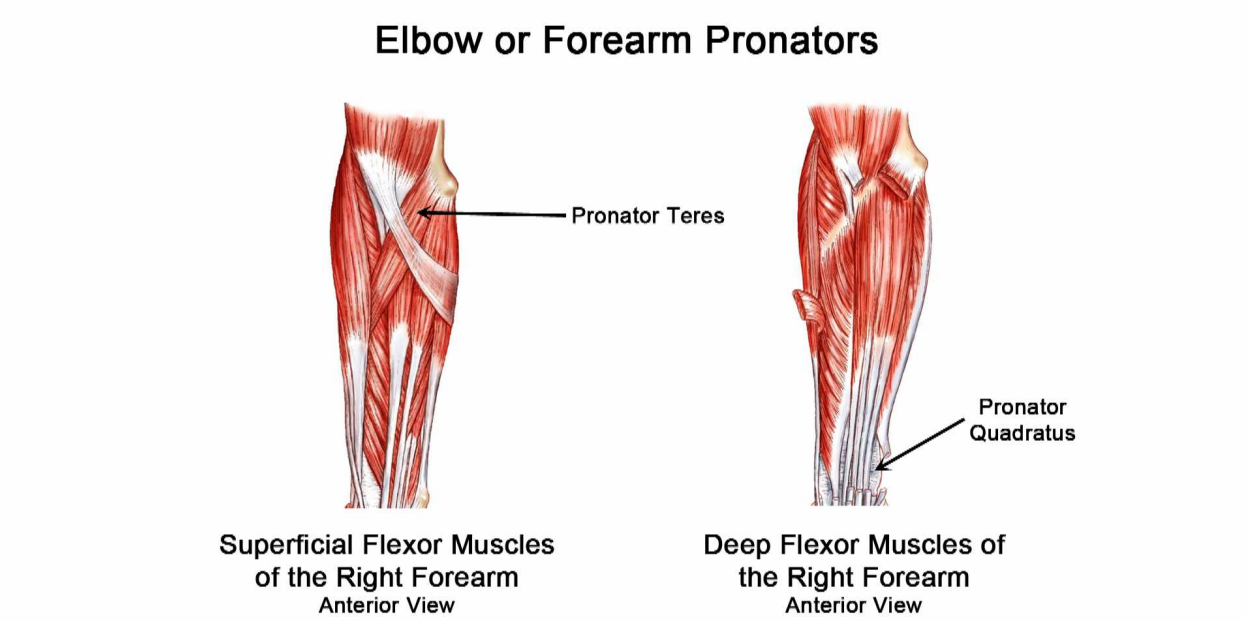


Figure 2-45.

Now let's focus our attention on the player's *left* hand in Figures 2-46a through 2-46d. The main action that the player's left hand and wrist are performing on the bat-handle during the cocking of the wrists is called *radial deviation*.

Figure 2-46a.

Figure 2-46b.

Figure 2-46c.

Figure 2-46d.

Radial deviation is a movement that occurs within the wrist where the entire hand moves toward the thumb. You may also think of it as trying to get your hand and thumb to move in a direction where the thumb tries to touch the side of your forearm as seen by the arrow shown in Figure 2-47 on the next page.

Figure 2-47.

It is by radially deviating the left hand and wrist that helps to bring the bat-handle, and consequently the bat-head, to the player's furthest backswing position.

And just like the right hand and wrist, keep in mind that this is a relatively small movement taking place in comparison to what the shoulders and upper arms are going through and so you may not pick up on it the first time by simply looking at the left hand and wrist. However, there is just enough of this radial deviation taking place to help move the bat-head to its furthest backswing position.

The muscles involved with radially deviating the left hand and wrist are the Extensor Carpi Radialis Longus, Extensor Carpi Radialis Brevis, and Flexor Carpi Radialis. See Figure 2-48.

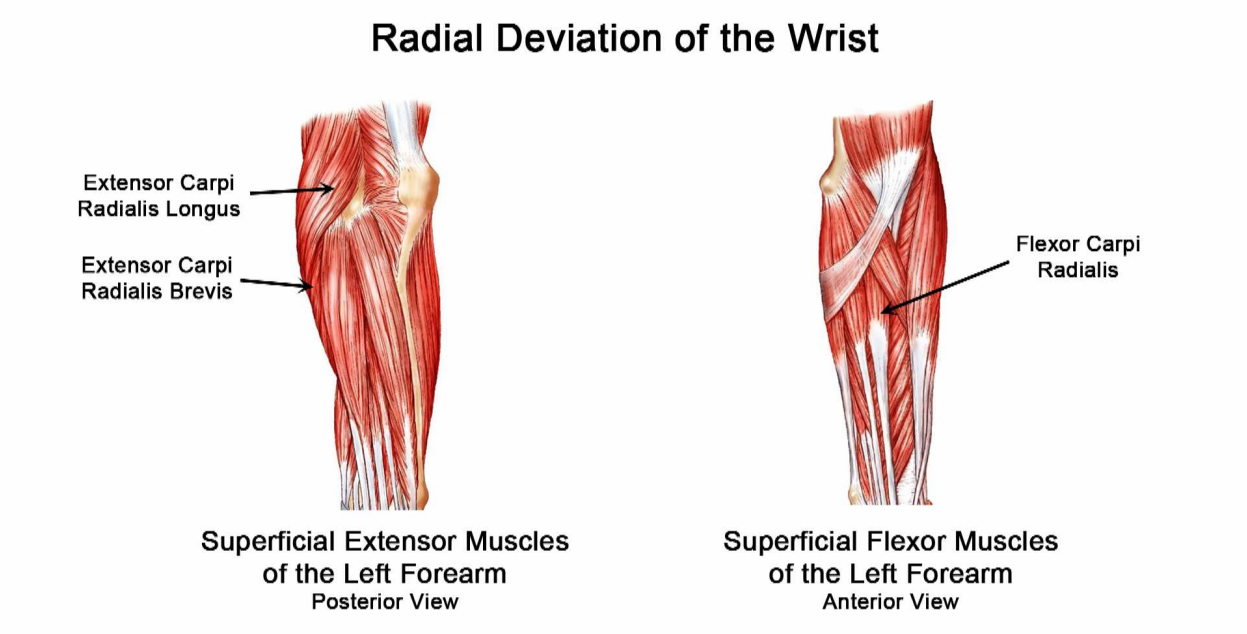


Figure 2-48.

The contraction of the *elbow pronators* in the right forearm and *radial deviators* in the left wrist moves the bat-head to the player's furthest backswing position. What this movement does is temporarily loads, or stretches, the antagonistic muscles in the right forearm, which are the right *elbow supinators*, and in left wrist, which are the left *ulnar deviators*, just long enough so that the player can time the stretching in these muscles, and subsequent contracting of them, to add extra momentum and power to his swing. See Figures 2-49a through 2-49d on the next page.

Figure 2-49a.

Figure 2-49b.

Figure 2-49c.

Figure 2-49d.

This is what is known as the *myotatic reflex* which is a muscle contraction in response to it first being rapidly stretched, i.e., loaded. It is a very powerful reflex within the muscle that can significantly increase the speed and strength in which it contracts. This is because it essentially gives the muscle a 'running start' in the direction of its intended path of contraction.

Now the myotatic (stretch) reflex is only usable for about a half of a second or less after a muscle has been stretched and then it dampens out, or weakens, and is no longer available. So the key to using this reflex within a stretched muscle, such as what takes place during the *cocking of the wrists*, is to time it at the precise moment that you need it.

Now these stretch reflexes occur not only in the muscles involved with cocking the wrists, but in every other muscle that was stretched so far during the loading (stretching) phase. This includes the muscles around both shoulders that were stretched during the *backward movement of the shoulders and arms*, the lateral spine rotators during the *backward rotation of the spine*, the hip extensors, knee extensors and ankle plantar-flexors during the *beginning of the timing step* and the external hip rotators during the *cocking of the hips*.

So these stretch reflexes play a very significant role in your ability to swing the bat harder and faster. Simply put, you couldn't swing the bat very hard or fast without them. And since they are only available within the muscle for about a half of a second, the timing of their creation and use is not only essential to just making contact with the ball, but doing so with power.

In the next chapter we are going to discuss something call the *timing mechanism* and see how these stretch reflexes are involved.

Chapter 3

The Timing Mechanism

The timing mechanism is defined as your ability to know when to initiate the transition from the loading phase into the launching phase so that should you decide to swing, you will have enough time to get the bat around to make good contact with the ball.

Therefore, in this chapter we will first identify 'how' the body transitions from the loading phase into the launching phase, i.e., the mechanism, and then second, we will identify 'when' this mechanism should occur, i.e., the timing.

THE MECHANISM

You may recall what I said in the previous section about the *cocking of the wrists* where it is an action the hands and wrists perform on the bat-handle at the very *end of the loading phase* and into the *first part of the launching phase*.

This means then that as the wrists are cocking, or still loading, other parts of the body must have started, or entered, the launching phase which is the phase that produces the swinging of the bat toward to the contact point with the ball.

So the *cocking of the wrists* represents an overlapping point of these two phases and is directly involved with the *transitioning of the body* from the loading phase into the launching phase.

Now, the question therefore is this: what part, or parts, of the body are first to enter the launching phase while the wrists are still cocking in the loading phase? To answer this question, let's go back and take a look at a sequence of images that we first saw on the *cocking of the wrists* from page 24 that have been reproduced below.

Figure 3-1a.

Figure 3-1b.

Figure 3-1c.

Figure 3-1d.

Figure 3-1a shows the *beginning of the cocking of the wrists* and Figure 3-1d shows the *end of the cocking of the wrists*. Now looking at the images above from left to right, the thing we want to pay attention to is the timing step which involves the player's left foot. The moment it begins to lower back to the ground will be the signal that the *launching phase has begun*. And while we don't have the benefit of slow motion video here in this book to follow every split second movement, we can tell from the still frame images that Figure 3-1c looks to be the first image where the timing step is on it's way back down.

So Figure 3-1c shows the start of the *launching phase* and this would mean the hips and legs have just begun their explosive rotation back toward the pitcher. But interestingly enough, it

also shows the bat-head has not yet reached its furthest backswing position which doesn't occur until Figure 3-1d. This could only mean that the entire upper body, including the spine, shoulders, arms and especially the hands and wrists are still in the *loading phase*. Figure 3-2 provides a quick summary of this transition between the two phases taking place.

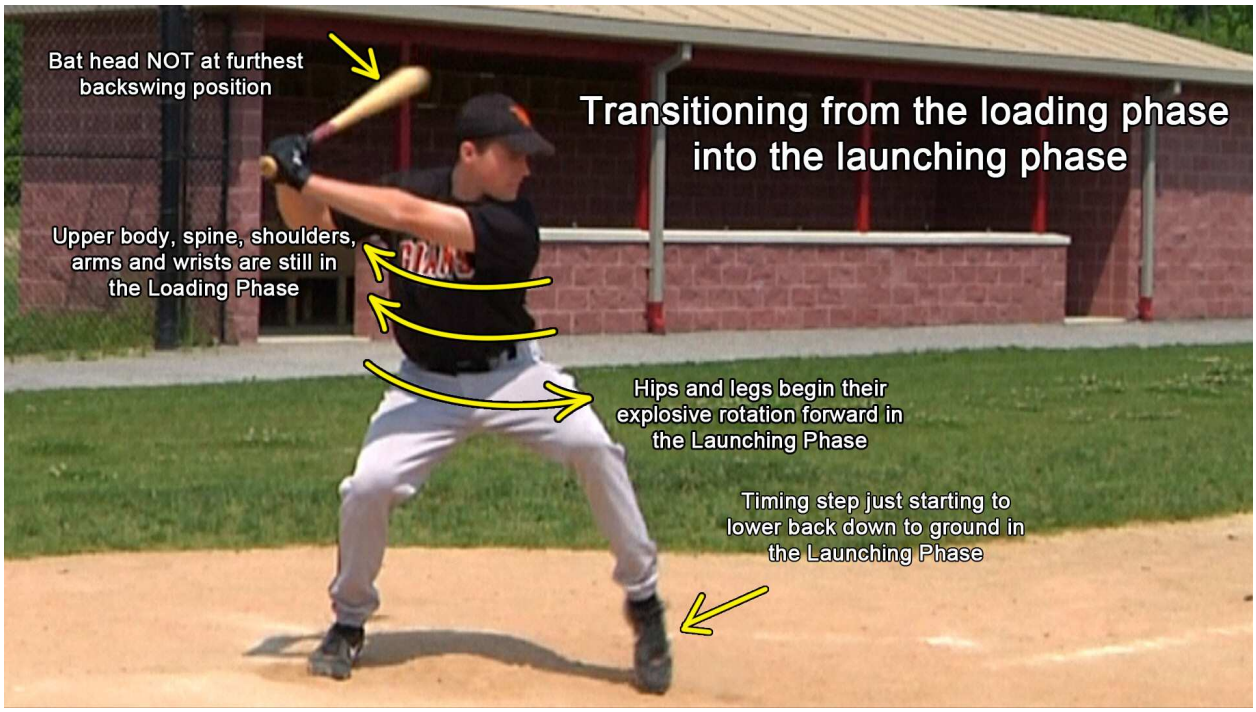


Figure 3-2.

So to answer our question earlier which was, "what part, or parts, of the body are first to enter the launching phase, while the wrists are still cocking in the loading phase?", the answer is the leg involved in the timing step, which is our player's left leg here, as well as both of the hips.

This transition 'is' the mechanism. As you start to place your timing step back to the ground the hips start to turn with it, and both of these *launching phase movements* occur while the wrists are still cocking in the *loading phase*. This is how the body starts its transition from the loading phase into the launching phase and this transition continues for as long as the wrists are still cocking.

The transition, or mechanism, ends when the wrists are fully cocked but that doesn't occur until the bat-head reaches its furthest backswing position (Figure 3-1d) seen again in Figure 3-3. This figure shows the wrists fully cocked and signifies not only the end of the loading phase for the entire body, but also the end of the transition, i.e., the mechanism, between the two phases.

Figure 3-3.

Figure 3-3 on the previous page is reproduced in Figure 3-4 with some key points added. First, it again shows the wrists fully cocked and the upper body rotated as far back as possible which we now know signifies the end of the loading phase and thus the end of the *mechanism*. It also shows the launching phase has advanced further along as we observe the timing step completely returned to the ground. But most importantly, Figure 3-4 represents the point in this particular swing where the body is undergoing *maximum stretch*, or where the *upper body* is turned farthest away from the *lower body*.

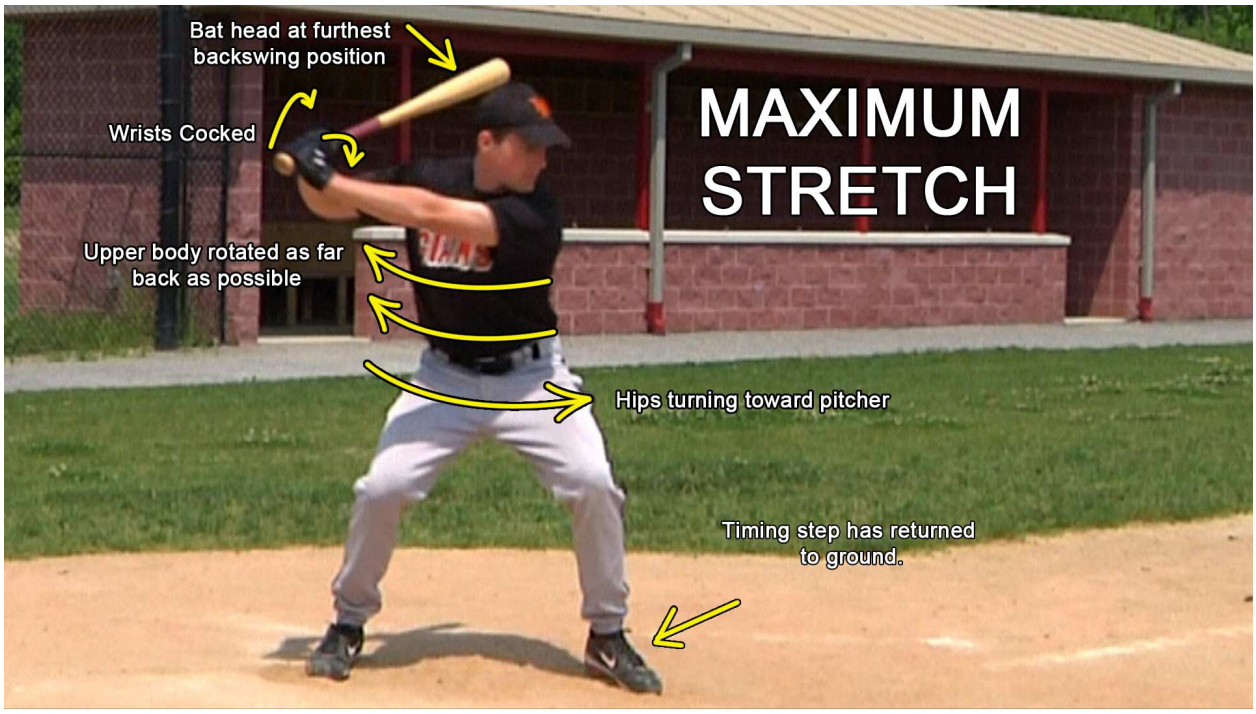


Figure 3-4.

Now looking back, there were a lot of muscles that helped contribute to the player getting into this position but the role the *cocking of the wrists* plays in all of this is as follows: having thrust the bat-head to its furthest backswing position, which is seen above in Figure 3-4, the *maximum stretch* position is achieved by the momentum of the bat-head pulling the hands, wrists, shoulders and upper body in the opposite direction of the intended path of the swing.

So, the purpose of the mechanism is not just to transition you from one phase to another, but to do so in a way that enables you to develop as much *stretch* in your muscles as needed. This stretching is very important to you as a batter because, as we learned in the last chapter, it is one of the keys to developing a faster and more powerful rotational bat swing, and *knowing when the right time to create it and use it* in your muscles is the subject of our next section.

THE TIMING

Okay, now that we know what the mechanism is that we are trying to create which again is the ability to transition from the loading phase into the launching phase while creating as much stretch within the muscles as needed, let's talk about the timing on 'when' you should do this.

If you recall from end of Chapter 2, the stretching in the muscles *in the opposite direction* of their intended path produced a reflex in them called the myotatic reflex. And this stretch reflex essentially gives the muscle a 'running start' *in the same direction* of its intended path of contraction. This enables the muscle to contract much harder and faster than if it wasn't first stretched.

But we also learned that while we are somewhat in control of when these reflexes are created, we cannot control the length of time that they will last. So these reflexes, which stay in your muscles for only about a half of a second or less, need to be used within that period of time if you ever expect to swing the bat with any power.

So, the challenge you face as a batter comes down to how much time you can let go by while waiting on the pitch before you initiate the mechanism that creates the stretch reflexes in your muscles.

If you create them too soon, they will disappear before you have a chance to use them. And if you create them too late, you won't be able to get the bat around in time to make good contact with the ball.

So, this is the 'timing' part of the *timing mechanism*: the ability to know *when to initiate* the transition from the loading phase into the launching phase so your stretch reflexes can be created and used within a split second of your decision to swing the bat.

The greatest recipient of this timing mechanism is of course, the bat-head and Figures 3-5a through 3-5d show the effect on it. Starting in Figure 3-5a, the player has knowingly cocked his wrists to push the bat-head to its furthest backswing position. This creates the maximum stretch position in the body and therefore determines the level of intensity of the myotatic reflexes. These reflexes now force the muscles along the spine, upper back, shoulders, arms and wrists to contract back in the same path of the swing which then causes a rapid change of direction with the bat-head as seen in Figures 3-5b and 3-5c. This rapid change of direction helps the player to swing the bat harder and faster to the contact point with the ball seen in Figure 3-5d.

Figure 3-5a.

Figure 3-5b.

Figure 3-5c.

Figure 3-5d.

The Timing Mechanism: your ability to know when to initiate the transition from the loading phase into the launching phase so that, should you decide to swing, you will have enough time to get the bat around to make good contact with the ball.

Chapter 4

The Launching Phase

The launching phase takes us from the end of the loading phase to the contact point with the ball and it consists of 5 noticeable movements: 1) the continuation of the timing step, 2) the opening of the hips, 3) the forward rotation of the spine, 4) the pushing and pulling action of the arms and shoulders and 5) the guiding action of the hands on the bat.

In this chapter we will define each of these movements in great detail as well as identify all of the muscles involved in performing them.

1) THE CONTINUATION OF THE TIMING STEP

The timing step began in the loading phase when the front leg was raised off the ground and the player's weight was momentarily rocked onto the back leg as seen in Figure 4-1a. Now the continuation of this timing step, where it begins to return back to the ground, is the first part of the launching phase as seen in Figure 4-1b.

Figure 4-1a.

Figure 4-1b.

Depending on the player's technique, the timing step of the front foot can actually be a short stride towards the pitcher by a few inches and perhaps more, or it can simply be placed back down on the ground as shown by our player's technique in Figure 4-2.

Figure 4-2.

But whichever technique is used, the lowering and turning of this timing step *outward*, to the ground, triggers the initiation of the swing.

This outward turning of the timing step is caused by muscles acting higher up in this player's left hip known as the External Hip Rotators and they force the toes of the player's left foot to point outward, in the direction of first base, as seen in Figure 4-3.

Figure 4-3.

Now, compare the player's left foot position in Figure 4-3 above with the one while in the *stance position* seen in Figure 4-4 below and you can see this repositioning more clearly.

Figure 4-4.

The names of these external hip rotator muscles in the player's left hip that turn his foot outward, down toward first base, are the Superior Gemellus, Piriformis, Obturator Internus, Inferior Gemellus, Obturator Externus, Quadratus Femoris, Gluteus Medius and Gluteus Maximus. These muscles can be seen in more detail in Figure 4-5.

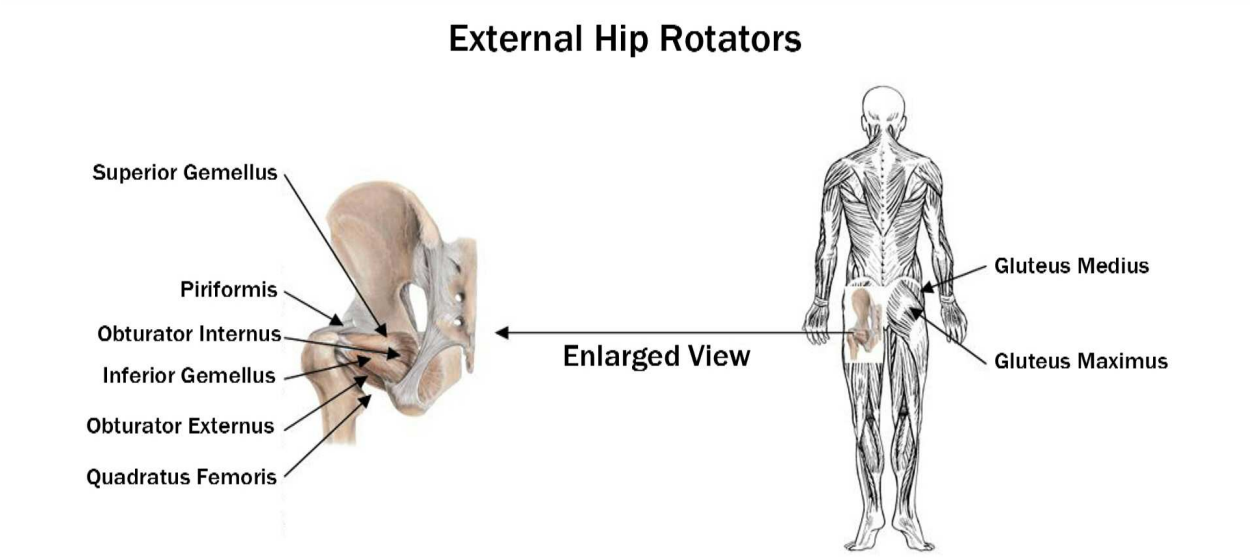


Figure 4-5.

Since a lot of one's batting power comes from hip rotation, the repositioning of the timing step, where the toes are now pointing outward down toward first base, is necessary since this starts the opening of both hips toward the pitcher, which is the direction the batter will end up facing at contact. See Figure 4-6.

Figure 4-6.

Now the contraction of the player's *left* external hip rotators (Figure 4-5 previous page) to point the toes outward will load, or stretch, the antagonistic or opposing muscles in this same *left* hip, namely the Internal Hip Rotators. The Internal Hip Rotators are the Gluteus Minimus, Gluteus Medius and Tensor Fascia Lata and these muscles can be seen in more detail in Figure 4-7.

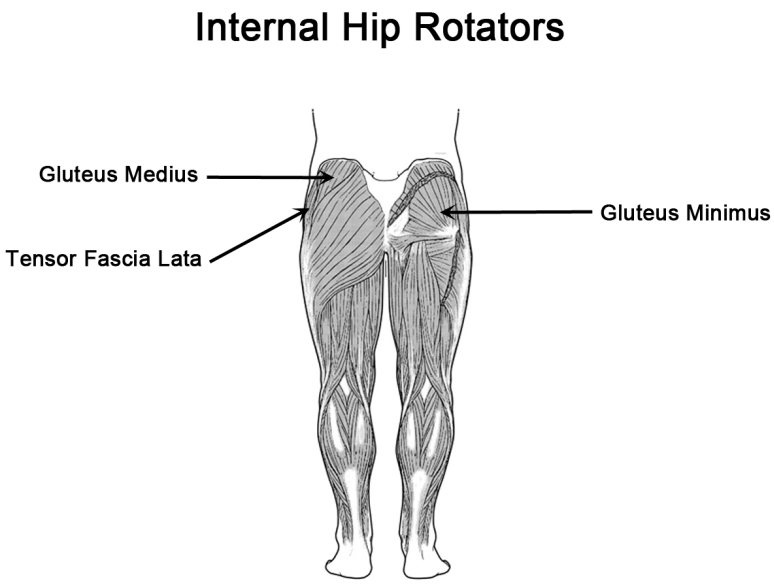


Figure 4-7.

You may have noticed that the Gluteus Medius is both an external and internal hip rotator and this is because the anterior fibers of this muscle cause internal hip rotation and the posterior fibers of this muscle cause external hip rotation.

Now these internal hip rotator muscles in the player's left hip will soon be called on to contract and help further pull the player's hips around in the swing when he is closer to the contact point with the ball as seen in Figures 4-8a through 4-8d.

Figure 4-8a.

Figure 4-8b.

Figure 4-8c.

Figure 4-8d.

In the next section we will talk about the second noticeable movement during the launching phase, which is the *opening of the hips*, and identify the muscles involved with it.

2) THE OPENING OF THE HIPS

Opening of the hips refers to the direction and movement that both hips turn, and eventually end up facing, when making contact with the ball which is forward, toward the pitcher, as seen in Figure 4-9.

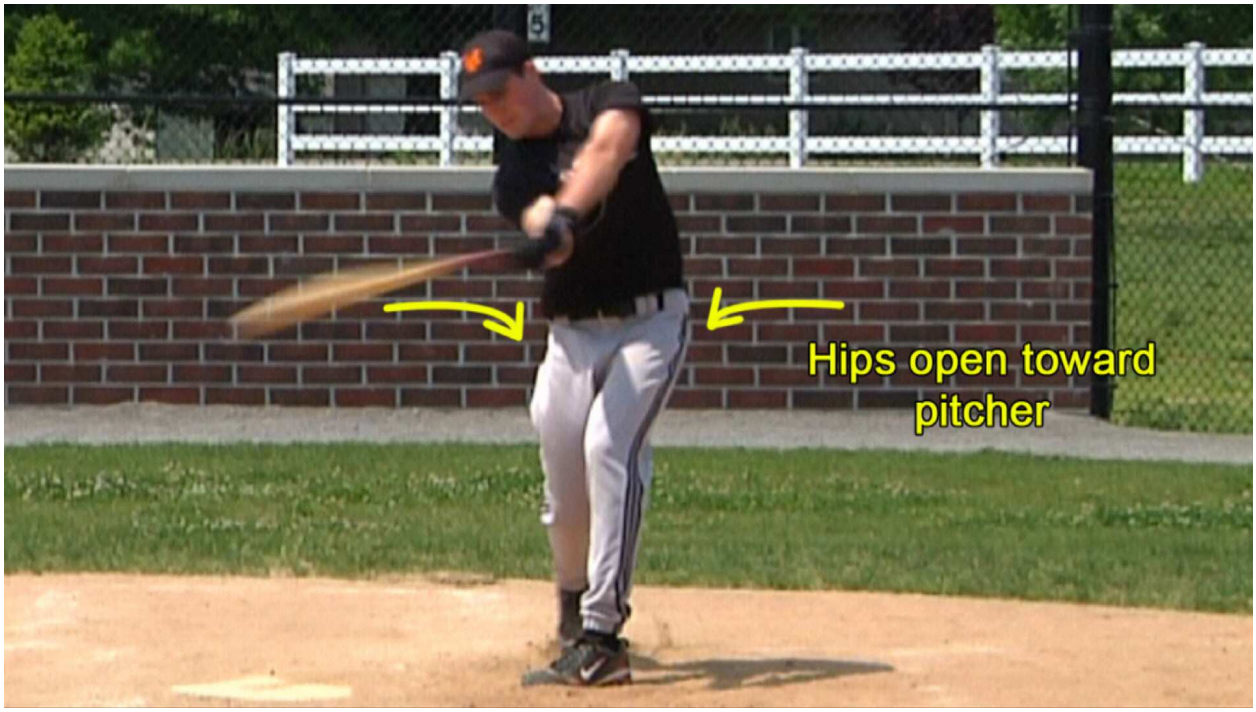


Figure 4-9.

This motion starts out in conjunction with the *continuation of the timing step* seen in the previous section. As the timing step is being placed back to the ground as seen in Figures 4-10a through 4-10c, the back right hip starts its turn, or rotation, toward the pitcher and as see in Figure 4-11 on the next page.

Figure 4-10a.

Figure 4-10b.

Figure 4-10c.

Figure 4-11.

This turning, or opening, of the back right hip toward the pitcher is caused by powerful contractions in the External Hip Rotators of this same right hip that if you recall, were previously stretched during the loading phase and identified back on page 22. Again, the names of these External Hip Rotators are Gluteus Medius, Gluteus Maximus, Superior Gemellus, Piriformis, Obturator Internus, Inferior Gemellus, Obturator Externus and Quadratus Femoris. These muscles can be seen again more clearly in Figure 4-12.

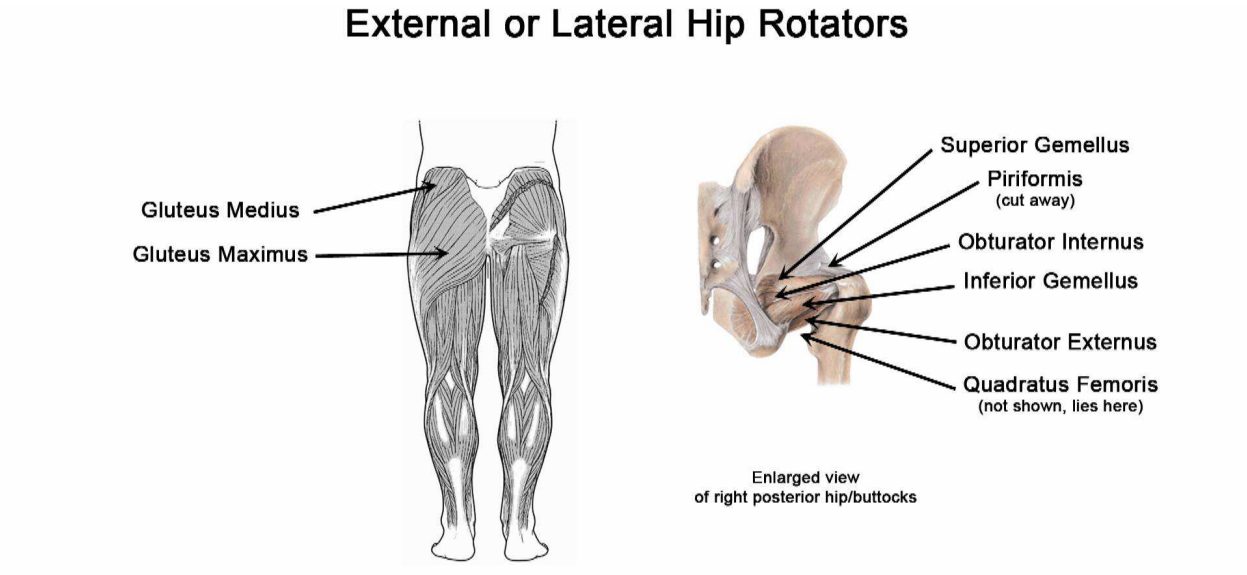


Figure 4-12.

So now these same External Hip Rotators that were previously stretched in the loading phase are now contracting here in the launching phase.

This intense muscular contraction of these External Hip Rotators, along with the continuation of the timing step, is the start of an incredible power release in the body as these muscles forcibly contract and rotate the player's back side, or right side, toward the pitcher as seen here from across home plate in Figures 4-13a through 4-13d.

Figure 4-13a.

Figure 4-13b.

Figure 4-13c.

Figure 4-13d.

Now this rotational hip power builds right from the start of the launching phase and it is further increased by the momentum and drive created by the pushing of this same *right leg* toward the pitcher.

This pushing motion of the right leg through contact involves three characteristic movements: 1) extension of the right hip, 2) extension of the right knee and 3) plantar-flexion of the right ankle. See Figure 4-14.

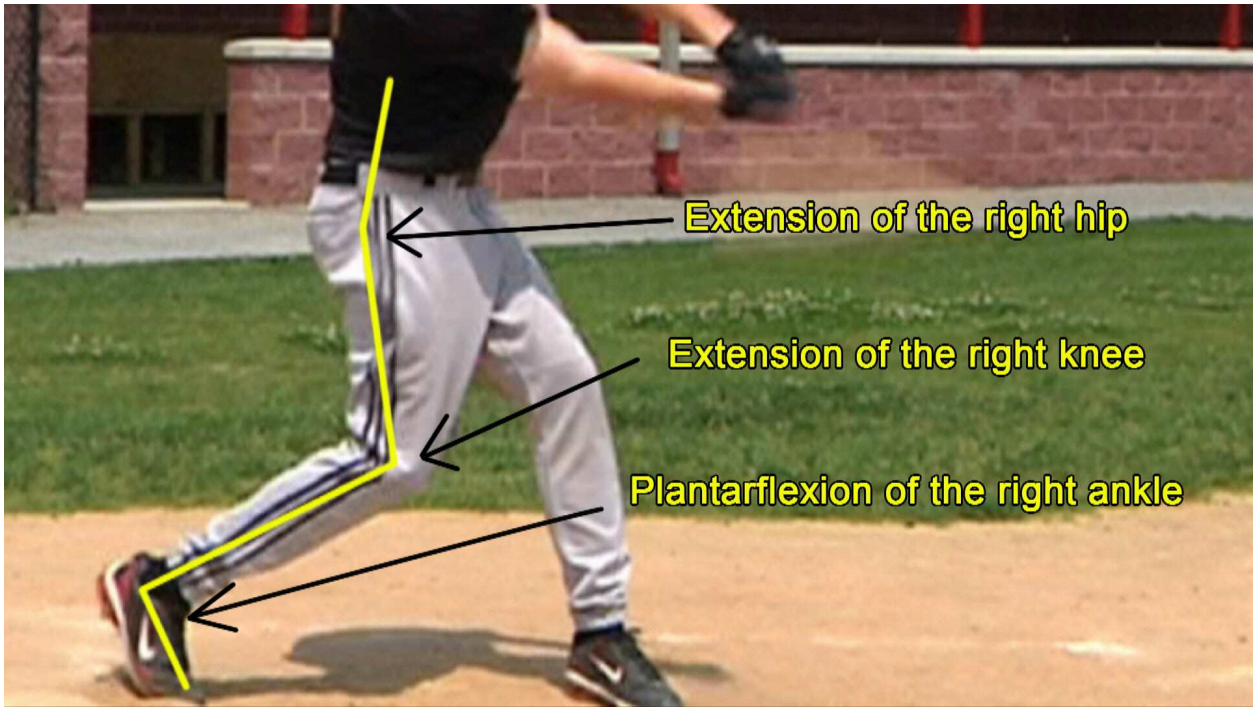


Figure 4-14.

To help you see these three actions in effect more clearly, let's take a look back to the beginning of the launching phase, but this time from behind home plate.

Here we are at the beginning of the launching phase and we see that the starting position for the right hip is flexion, the starting position for the right knee is also flexion and the starting position for the right ankle is dorsi-flexion. See Figure 4-15.

Figure 4-15.

Now let's compare this figure (Figure 4-15) showing the start of the launching phase with the previous one (Figure 4-14) at the point of contact with the ball. See Figure 4-16.

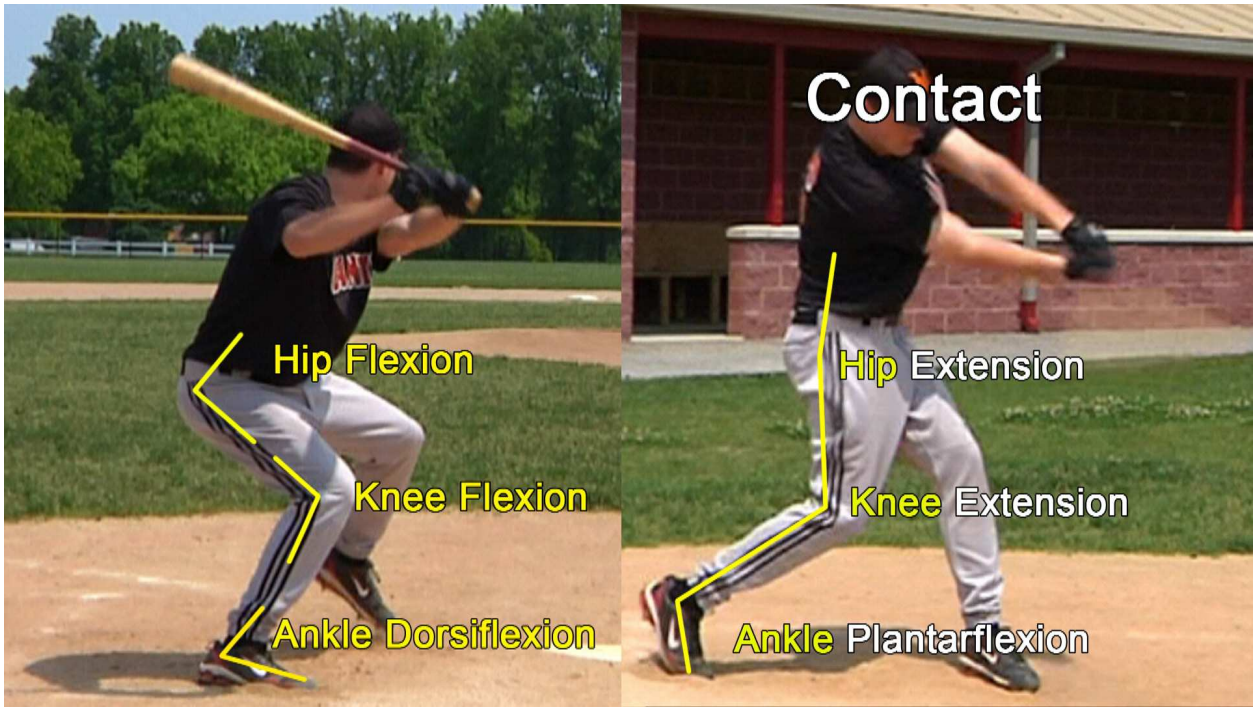


Figure 4-16.

At contact we now see that the right hip has extended from its starting position and you can see this just by comparing the angles at the hip in Figure 4-16. The right knee has also extended a little from its starting position and the right ankle has plantar-flexed from its starting position.

Now keep in mind that the right hip is not in complete extension, the right knee is also not in complete extension and the right ankle is not in complete plantar-flexion however, these are the actions, or motions, that are taking place in these three joints all the while the hips are opening toward the pitcher and they contribute incredible lower body strength and power to the swing.

Now, the muscles involved with hip extension are the Gluteus Maximus and the hamstrings muscles which are the Semimembranosus, Semitendinosus and the long head of the Biceps Femoris. For the record, the hort head of the Biceps Femoris does not cross the hip joint and is therefore not considered an extensor of the hip. These muscles can bee seen in more detail in Figure 4-17.

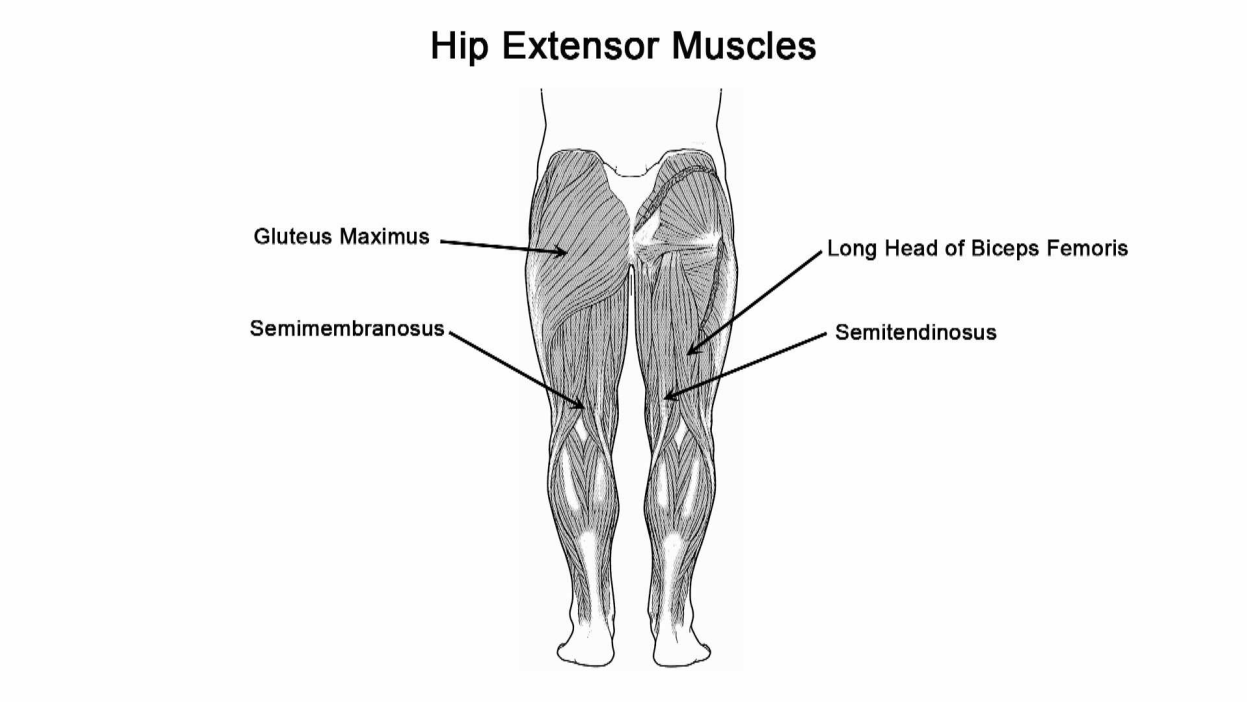


Figure 4-17.

The muscles involved with knee extension are the Quadriceps muscles, or more specifically, the Vastus Medialis, Vastus Lateralis, Vastus Intermedius and Rectus Femoris. These muscles can be seen in greater detail in Figure 4-18 on the next page.

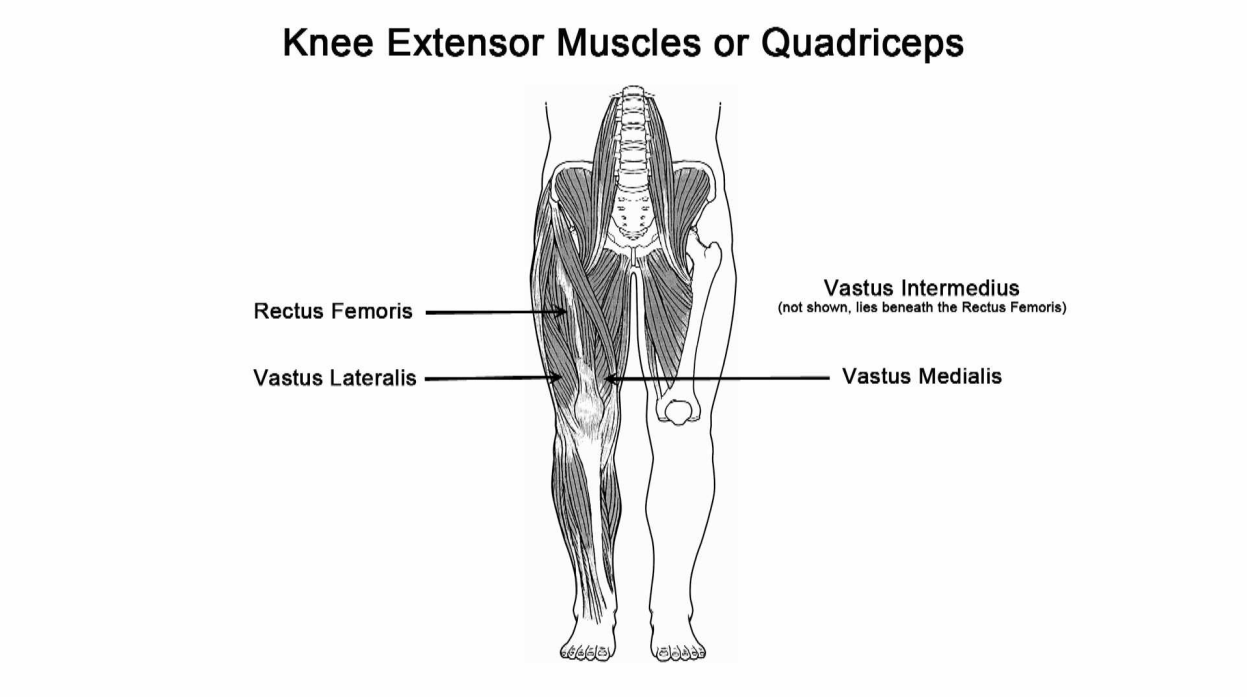


Figure 4-18.

The muscles involved with ankle plantar-flexion are the calf muscles which include the Gastrocneumius and Soleus. These muscles can be seen in greater detail in Figure 4-19.

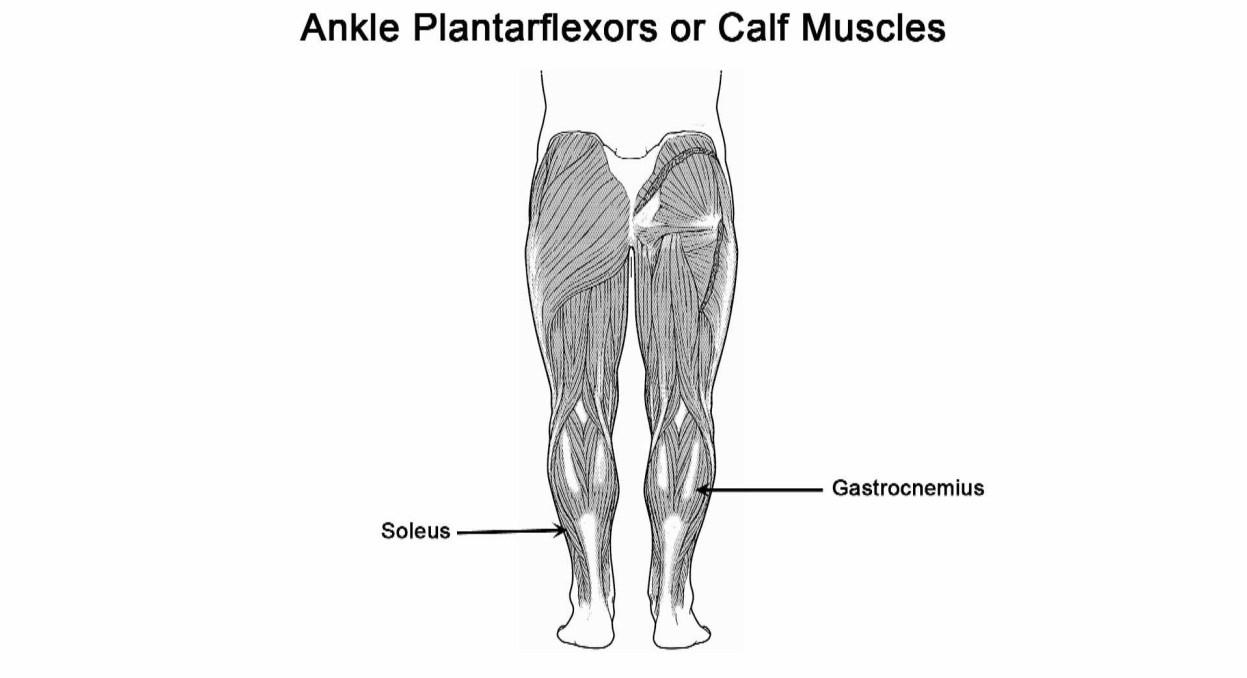


Figure 4-19.

Now as the player's back right hip is rotating and opening toward the pitcher and this same right leg is further driving or pushing, the players front *left* leg is stiffening and the knee starts to extend or straighten out. See Figure 4-20a. This stiffening and straightening of the left knee and leg produces a force in the left hip acting in the opposite direction as the right hip. See Figure 4-20b. As a result, a short, compact and explosive pivoting action across the player's pelvis is created that carries up the spine. See Figure 4-20c.

Figure 4-20a.

Figure 4-20b.

Figure 4-20c.

Here's another look at the straightening of the left knee and leg from down third base line. Figure 4-21a shows the swing just past the point of contact and we can again see how the straightening of the left knee and leg forces the left hip backward, in the opposite direction as the right hip as seen in Figure 4-21b. Again, this creates a short, compact and explosive pivoting action across the player's pelvis that carries up the spine. See Figure 4-21c.

Figure 4-21a.

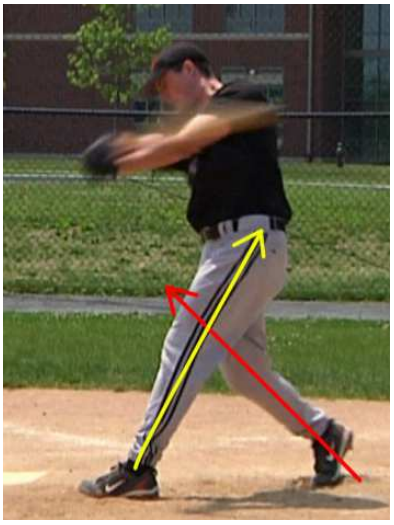


Figure 4-21b.

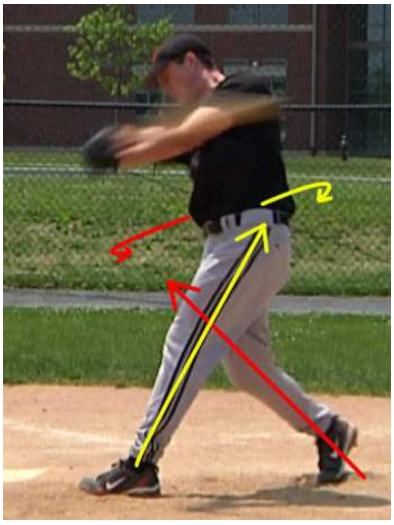


Figure 4-21c.

The combination of the hips exploding open toward the pitcher, along with the massive torque created across the pelvis by the pushing of both legs in opposite directions through contact, is the primary source of power in the player's swing.

In the next section we will talk about the third noticeable movement during the launching phase, which is the *forward rotation of the spine*, and identify the muscles involved with it.

3) THE FORWARD ROTATION OF THE SPINE

The forward rotation of the spine refers to the direction and movement that takes place in the upper body during the launching phase, which is forward, toward the pitcher. See Figure 4-22.

Figure 4-22.

If you recall during the loading phase back on page 11, we talked about the *backward rotation of the spine*, and this was where the chest, abdomen and entire upper body were all turned back toward the catcher as seen from behind home plate in Figure 4-23.

Figure 4-23.

In that section, we identified the muscles responsible for this movement as the *lateral rotators of the spine* on the left side of the player's body. Specifically, their names are the External Abdominal Oblique, Multifidus and the Rotatores Spinea muscles. See Figure 4-24.

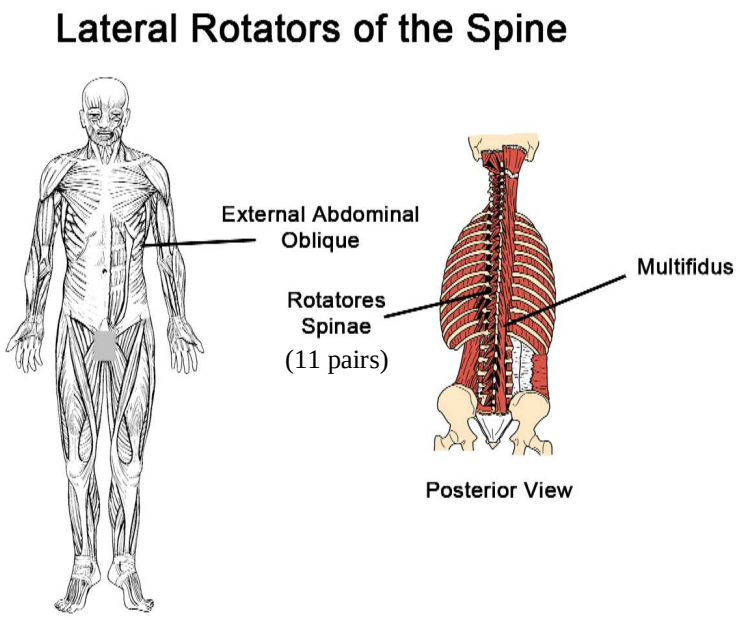


Figure 4-24.

Now the contraction of these muscles on the players *left* side during the loading phase caused the lateral rotators of the spine on the players *right* side to stretch. And it is now, during the launching phase, where we can see the effect of these stretched lateral rotators of the spine on the right side of the player's body.

Notice how at the beginning of the launching phase shown in Figure 4-25a, we cannot see the player's number, but as he begins to swing, his entire upper body is turning so that at contact, his number is completely visible as seen in Figure 4-25c.

Figure 4-25a.

Figure 4-25b.

Figure 4-25c.

This turning of the spine and upper body is a direct result of the contraction taking place in these lateral rotators of the spine on the player's right side and again, their names are External Abdominal Oblique, Multifidus and Rotatores Spinea muscles. See Figure 4-26 on next page.

Figure 4-26.

So now, if we look across home plate, as the hips begin their explosive rotation toward the pitcher and torque is building across the pelvis (Figure 4-27a), this ever increasing rotational power source (Figure 4-27b) is also being combined with the contraction of the lateral rotators of the spine on the player's right side (Figure 4-27c).

Figure 4-27a.

Figure 4-27b.

Figure 4-27c.

This intense buildup of speed and power in the lower body and upper body helps pull the arms around to deliver a quicker, stronger and more dynamic rotational bat swing.

In the next section we will talk about the fourth noticeable movement during the launching phase, which is the *pushing and pulling action of the arms and shoulders*, and identify the muscles involved with it.

4) THE PUSHING AND PULLING ACTION OF THE ARMS AND SHOULDERS

The pushing and pulling action of the arms and shoulders refers to the individual movements that each arm and shoulder produce on the bat handle through their respective hands during the swing.

Since each hand grabs the bat handle from a different direction, the force from the respective arm and shoulder that it is generating on it will also be different. See Figure 4-28.

Figure 4-28.

Let's start by taking a look first at the player's left arm during the swing. Since the left arm and shoulder are positioned in front of the left hand (Figure 4-29a) during the direction of the swing, or during the direction of the force (Figure 4-29b), then the left arm and shoulder will *pull* on the bat-handle throughout the swing (Figures 4-29c and 4-29d).

Figure 4-29a.

Figure 4-29b.

Figure 4-29c.

Figure 4-29d.

And if we take a look now at the player's right arm during the swing, we see that his right arm and shoulder are positioned behind the right hand during the direction of the swing, or during the direction of the force (Figure 4-30a), and so the right arm and shoulder will *push* on the bat-handle as seen here throughout the swing (Figures 4-30b through 4-30d).

Figure 4-30a.

Figure 4-30b.

Figure 4-30c.

Figure 4-30d.

Okay, so now that we know for the right-hand batter that the left arm pulls on the bat handle and the right arm pushes on it, let's define the muscles involved in both of these arms during this part of the swing, beginning with the left arm first.

If you recall during the loading phase back on page 9, Figure 2-10, the muscles on the back side of the left shoulder were stretched. Primarily, these were the Posterior Deltoid, Rhomboids and middle fibers of the Trapezius muscles. See Figure 4-31a. And with the left arm completely adducted across the front of the body seen in Figure 4-31b, two of the rotator cuff muscles were also be stretched in the back of the left shoulder which are the Teres Minor and Infraspinatus muscles.

Figure 4-31a.

Figure 4-31b.

These five muscles can be seen again in more detail in Figure 4-32 on the next page.

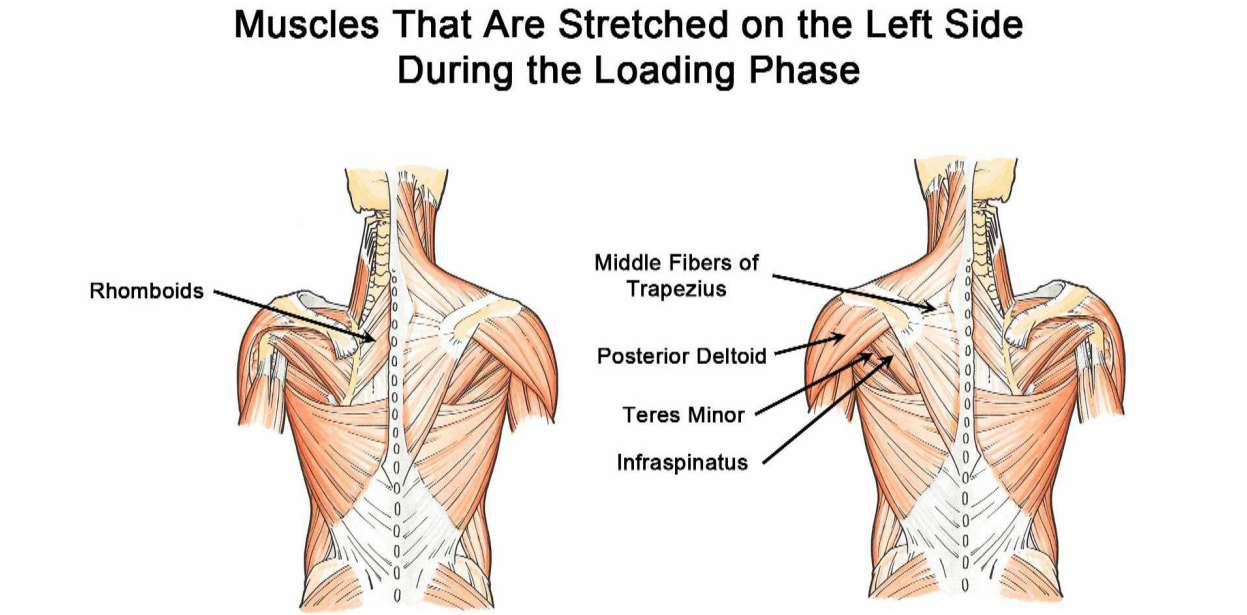


Figure 4-32.

Now all five of these muscles contract during the launching phase and pull the left arm around bringing the bat-head in contact with the ball. See Figures 4-33a through 4-33d.

Figure 4-33a.

Figure 4-33b.

Figure 4-33c.

Figure 4-33d.

And before we go on to the muscles of the right arm, there is one more important muscle group worth mentioning regarding the left arm and that is the elbow, or forearm, extensors. This muscle group doesn't pull the arm around during the launching phase like the previous five muscles we discussed but rather, they help to extend the left elbow or forearm at contact. See Figure 4-34.

Figure 4-34.

Specifically, the elbow extensors are the Triceps and Anconeus muscles, and these can be seen more specifically in Figure 4-35.

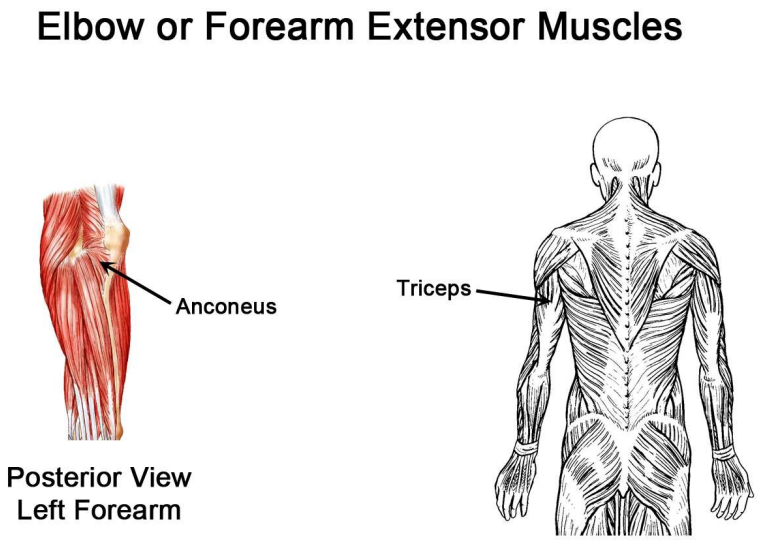


Figure 4-35.

Okay, now let's take a look at the player's right arm. Again, going back to the loading phase on page 9, Figure 2-11, we found that when the right arm was abducted away from the body it stretched muscles acting around the right shoulder and chest. See Figure 4-36.

Figure 4-36.

The muscles that were stretched were the Latissimus Dorsi, Teres Major, Pectoralis Major and Serratus Anterior muscles and these can be seen more specifically in Figure 4-37 on the next page.

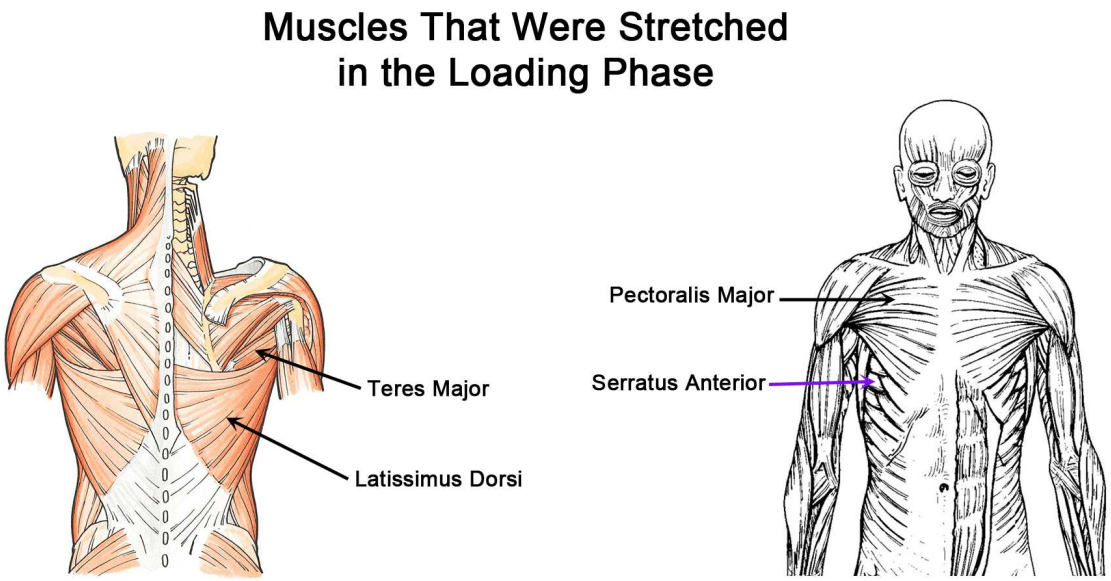


Figure 4-37.

Now, as the swing develops, the right elbow drops down and tucks in tight against the body making the shape of the letter "L" seen in Figure 4-38. This action is driven by the Latissimus Dorsi and Teres Major muscles which were previously stretched and seen above in Figure 4-37.

Figure 4-38.

The right elbow also supinates in the process which forces the palm of the hand to start turning upward. This is caused by the elbow supinator muscles or more specifically, the Biceps and the Supinator. These muscles can be seen more clearly in Figure 4-39.

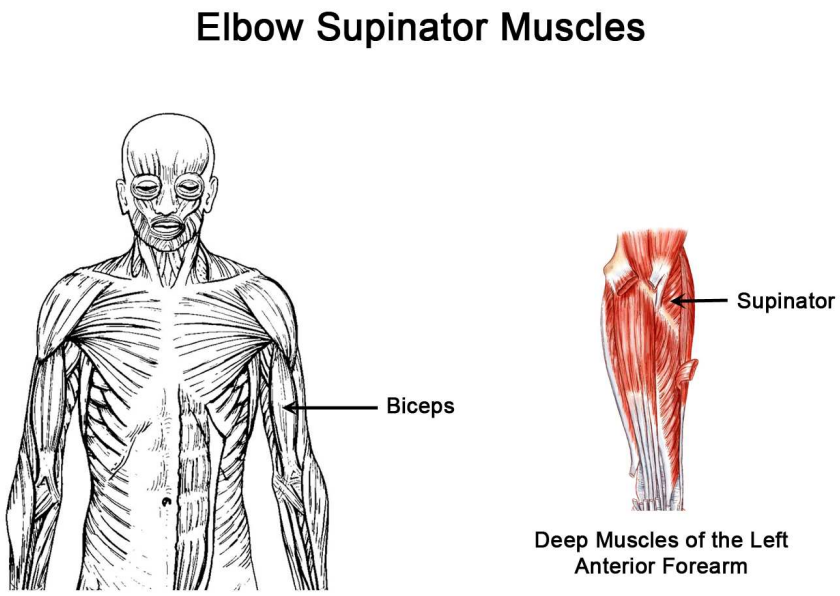


Figure 4-39.

As a result of these two actions the knob end of the bat points forward. See Figure 4-40.

Figure 4-40.

Now, as the body continues it's rotation toward the pitcher, the right arm applies a short but hard push forward (Figure 4-41a) which brings the bat-head around (Figure 4-41b) near the contact point with the ball (Figure 4-41c).

Figure 4-41a.

Figure 4-41b.

Figure 4-41c.

This pushing motion of the right arm is caused primarily by the Pectoralis major and Serratus Anterior muscles with help from the Anterior Deltoid and Coracobrahialis muscles. See Figure 4-42.

Muscles That Push the Right Arm During the Launching Phase

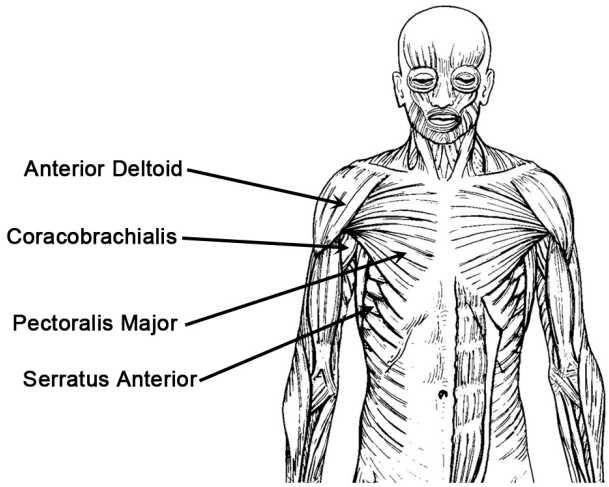


Figure 4-42.

The elbow also starts to extend in the process, though not completely, just like the left arm and this can be seen in Figure 4-43 on the next page.

Figure 4-43.

This movement is caused by the elbow extensor muscles, which are the Triceps and Anconeus muscles, and can be seen again in Figure 4-44.

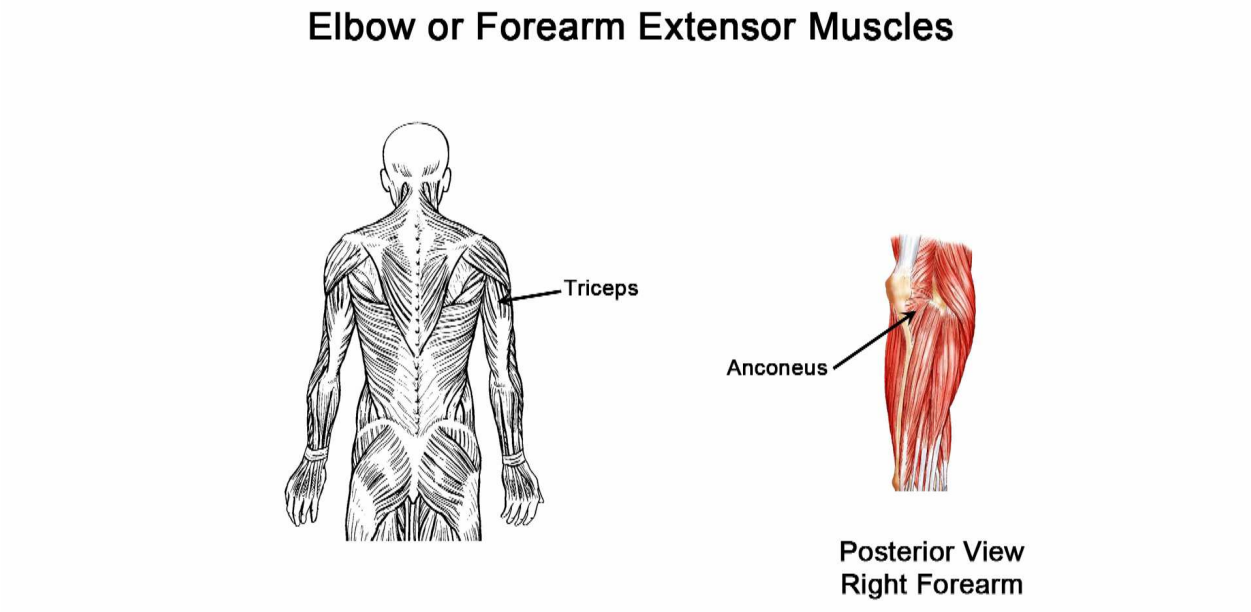


Figure 4-44.

In the next section we will talk about the fifth and last noticeable movement during the launching phase, which is the *guiding action of the hands on the bat,* and identify the muscles involved with it.

5) THE GUIDING ACTION OF THE HANDS ON THE BAT

The bat-head is the recipient of all the centrifugal force created in the body due to the rotation of the hips and spine along with the pushing and pulling action of the shoulders and arms. This is made possible by seven muscles in each hand and three muscles in each forearm holding the bat-handle with a firm grip. See Figure 4-45.

Figure 4-45.

The hand grip muscles located in the hands are the Flexor Digiti Minimi Brevis, Opponens Digiti Minimi, Opponens Pollicis, Flexor Pollicis Brevis, Adductor Pollicis, Palmar Interossei and First Dorsal Interossei. See Figure 4-46.

Figure 4-46.

The hand grip muscles located in the forearms are the Flexor Pollicis Longus, Flexor Digitorum Superficialis and the Flexor Digitorum Profundus. See Figure 4-47.

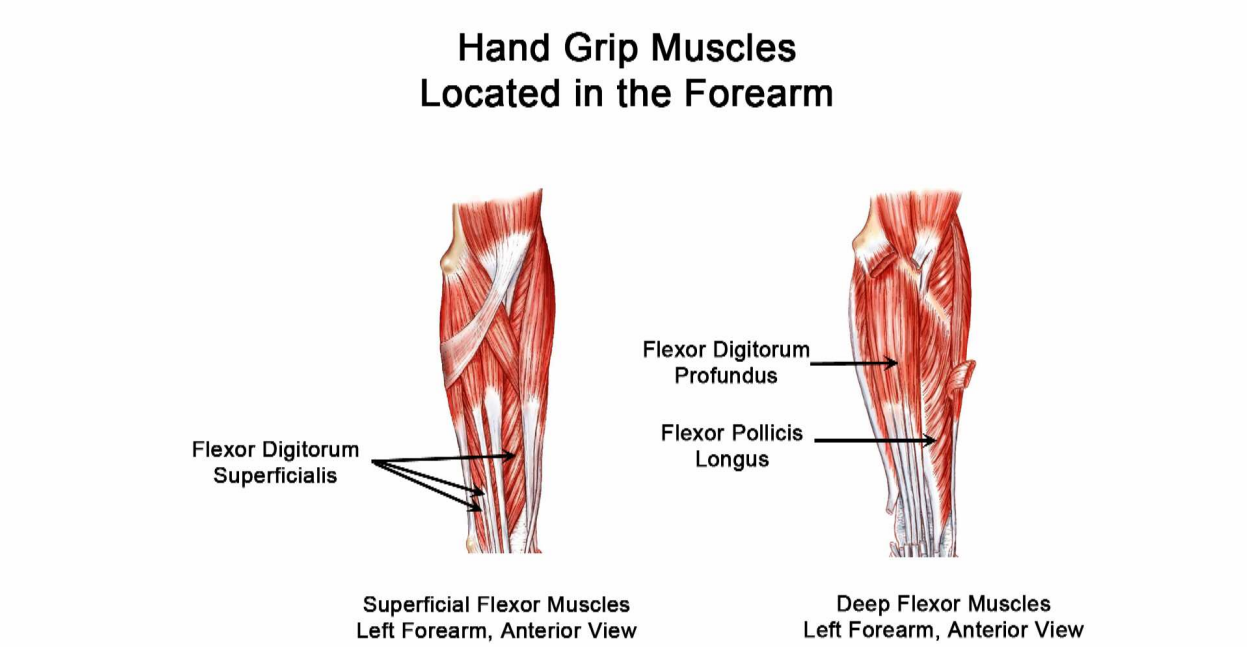


Figure 4-47.

Now aside from holding the bat-handle with a firm grip, the hands other job is to supply direction to the bat from the initiation of the swing to contact with the ball.

This starts with the hands first directing the *knob end* of the bat inside the flight of the pitch towards the center of the ball as seen in Figure 4-48a. With all the explosive rotational movement taking place in the body, the bat-head is soon found lagging behind the hands as seen in Figure 4-48b.

Figure 4-48a.

Figure 4-48b.

The rotation of the body and the action of the shoulders and arms will help bring the bat-head around toward the contact point with the ball however, any movement in the wrist joints that was done prior to this point during the loading phase, such as that which would have taken place during the cocking of the wrists, will have to be restored, or returned, to a more neutral position at contact. See Figure 4-49.

Figure 4-49.

This is because the best position for the wrists and hands to be in to transfer all of this explosive rotational power into the bat is *square*, or *neutral*, with respect to the forearms. This means the wrists are in a position without any flexion, extension, radial deviation (abduction) or ulnar deviation (adduction) or any combination of these.

Hand and wrist joints are at their strongest in this neutral position which is necessary to power the bat-head through the ball without being deflected. If the bat-head is deflected in any way when making contact with the ball due to a weak grip, loss of power will result. So, this is why it's important to make contact with the ball with the hands and wrists in a neutral, or square, position.

Now as a side note here, if you look closely at Figure 4-50 on the next page, you will notice that at contact, the player's *left forearm is in a pronated* position and the *right forearm is in a supinated* position, but neither of these forearm positions affects the wrist joint.

Figure 4-50.

If you recall during the loading phase, on the section of *cocking of the wrists* beginning on page 24, we saw that pronation of the forearm occurs at both the elbow joint and wrist joint however the motion that is provided by the pronator quadratus muscle at the wrist doesn't cause any flexion, extension, radial deviation or ulnar deviation in the wrist thereby keeping the wrist in a neutral position. And while we didn't mention it there, supination of the forearm takes place only at the elbow joint and not at the wrist joint. Again, the pronation of the right forearm and supination of the left forearm at contact does not affect the position of the wrist joints.

So, to finish up here, the ideal contact point is where the bat-head meets the ball at 90º from the direction of the pitch with the wrists in a neutral, or square, position. However, a margin of 15º degrees in either direction will still enable you to hit the ball with tremendous power.

Chapter 5

The Follow Through

The follow through takes us from the contact point with the ball to the natural ending of the swing. It involves the continuation of all the rotation taking place in the hips and spine, along with the continuation of the pulling and pushing actions of the arms on the bat and it also involves a roll-over of the forearms. Each of these movements will be discussed here in this chapter starting with the hips.

At contact (Figure 5-1a), we see that both hips are visible, or open, to the pitcher. If we compare them to the end of the swing (Figure 5-1b), we can see they have rotated all the way around until they can no longer go any further as long as both feet remain in contact with the ground.

Figure 5-1a.

Figure 5-1b.

Now interestingly enough, at the end of the follow through both hips end up in medial, or internal, rotation.

Looking at the player's right foot and thigh in Figure 5-2 on the next page, notice how his right foot is turned in toward his body. This is made possible by the right thigh turning inward, or medially, at the hip joint.

Likewise, notice the left foot in Figure 5-2 on the next page is also turned inward toward his body. This is made possible by the left thigh turning inward, or medially, at the hip joint.

Figure 5-2.

This medial rotation of both hips, and consequently both thighs and feet, is caused by the medial, or internal, hip rotator muscles which we first identified during the launching phase on page 38. Again, the names of these internal hip rotators are the Gluteus Minimus, Gluteus Medius and Tensor Fascia Lata muscles and the can be seen in Figure 5-3.

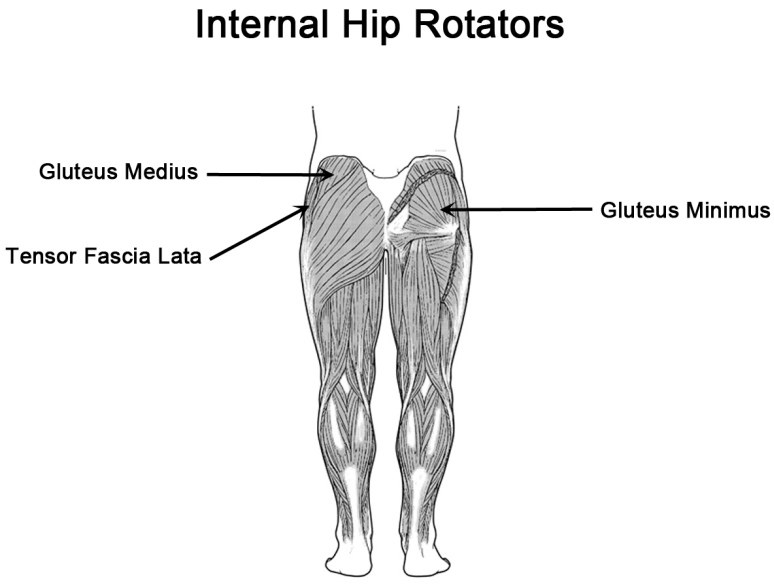


Figure 5-3.

We also learned during the launching phase that the player's front left leg stiffens during this process where the left knee starts to extend or straighten out seen in Figure 5-4a. This stiffening and straightening of the left knee and leg produces a force in the left hip acting in the opposite direction as the right hip. See Figure 5-4b. As a result, this further assists the hips to open completely toward the pitcher.

Figure 5-4a.

Figure 5-4b.

The muscle in the left leg that helps straighten or extend, the knee is the quadriceps muscle which was previously identified on page 17 and shown again in Figure 5-5.

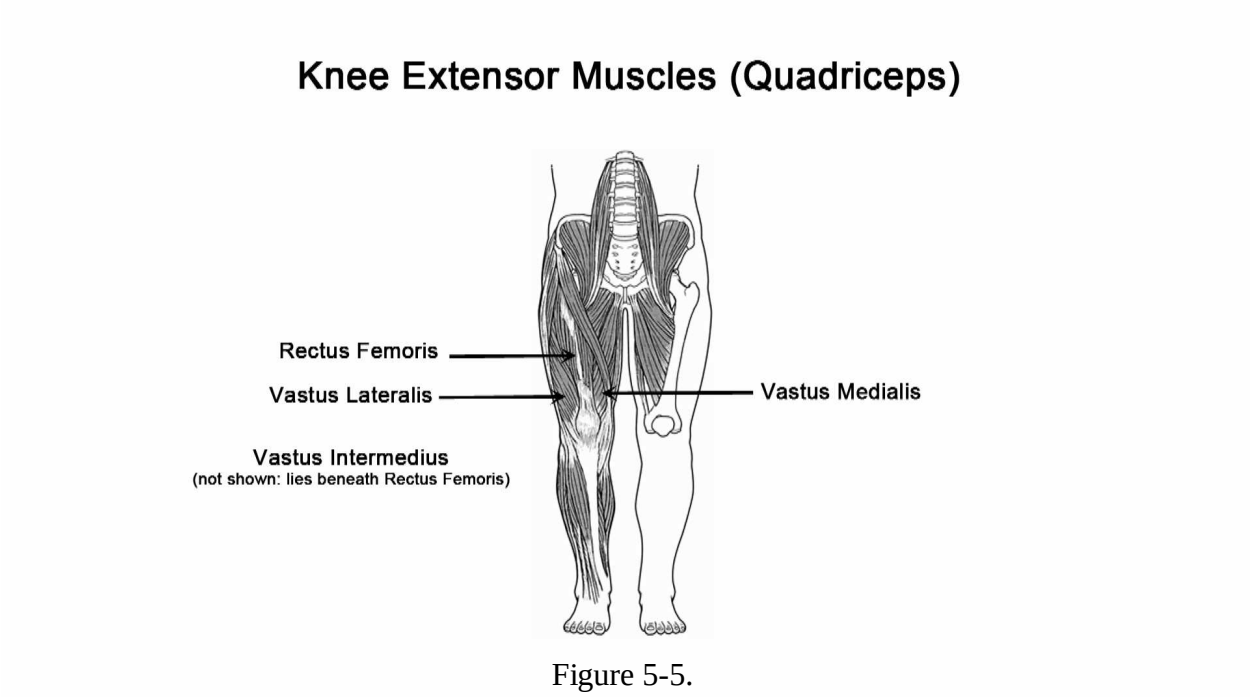


Figure 5-5.

Now let's take a look at the player's spine or perhaps an easier reference point for us to focus on here would be his abdomen and chest. Just like the hips at contact (Figure 5-6a), the chest is visible to the pitcher, and as we follow it through to the end of the swing, we can see the player's chest completely turn and rotate around to the point where it is now facing down the third base line and cannot go any further. See Figure 5-6b.

Figure 5-6a.

Figure 5-6b.

If you recall during the launching phase, the lateral rotators of the spine on the player's right side were responsible for this movement and were identified as the External Abdominal Oblique, Multifidus and Rotatores Spinae. These muscles continue to contract after contact to the end of the swing and are shown for you again in Figure 5-7.

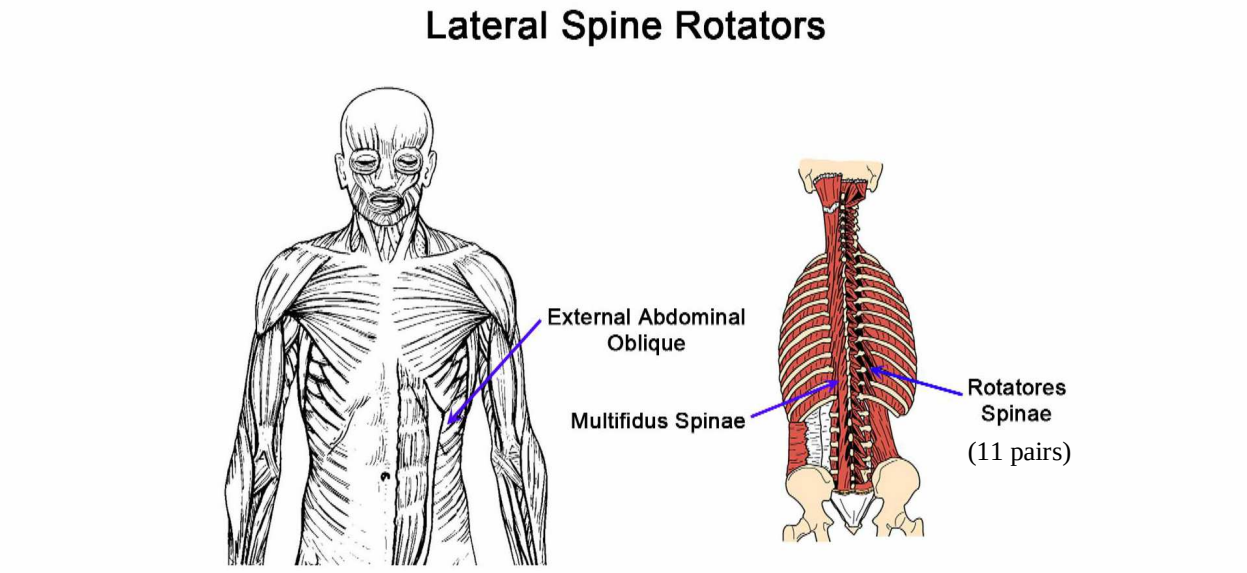


Figure 5-7.

Now let's focus on the arms, beginning with the player's left arm. We learned in the launching phase that the left arm *pulls* on the bat handle and this pulling action continues on after contact all the way through to the end of the swing as seen in Figures 5-8a through 5-8c.

Figure 5-8a.

Figure 5-8b.

Figure 5-8c.

The muscles responsible for this movement are the Posterior Deltoid, Rhomboids and Middle Fibers of the Trapezius muscles and by virtue of the positioning of the left arm during the swing, two of the rotator cuff muscles were also involved, those being the Infraspinatus and Teres Minor. These muscles were first seen in Figure 4-32 back on page 51 and shown again for you in Figure 5-9.

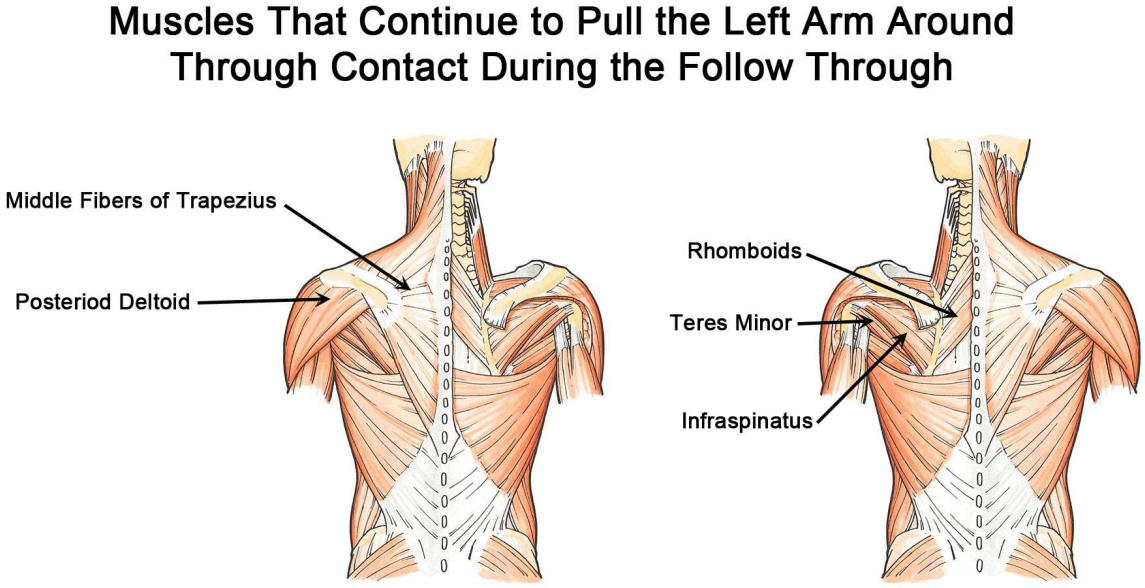


Figure 5-9.

Now, regarding the player's right arm, we also learned back in the launching phase that it *pushes* on the bat-handle and this pushing action continues on after contact all the way through to the end of the swing as seen in Figures 5-10a through 5-10c.

Figure 5-10a.

Figure 5-10b.

Figure 5-10c.

The muscles responsible for this movement after contact are the Pectoralis Major, Serratus Anterior, Coracobrachialis and Anterior Deltoid muscles. These muscles were first seen in Figure 4-42 back on page 55 and shown again for you in Figure 5-11.

Muscles That Continue to Push the Right Arm Through Contact During the Follow Through

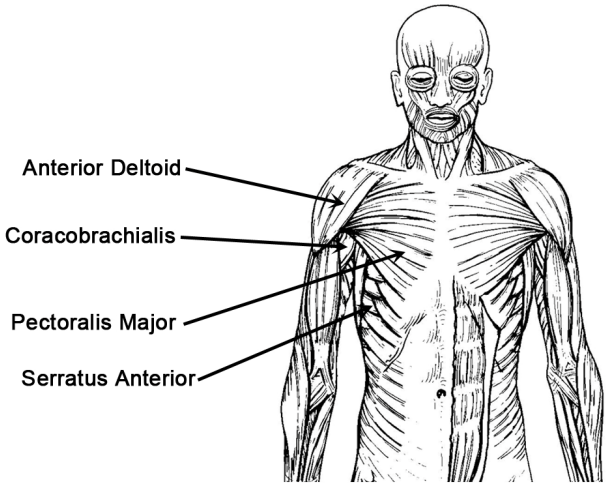


Figure 5-11.

Finally, the wrists and forearms do a rollover after contact where the right forearm, which is initially in a supinated position at contact seen in Figure 5-12a, ends up in a pronated position at the end of the swing seen Figure 5-12b.

The left forearm, which is in a pronated position at contact seen in Figure 5-12a, ends up in a supinated position at the end of the swing seen in Figure 5-12b.

Figure 5-12a.

Figure 5-12b.

These alternating forearm positions enable the player to swing the bat unimpeded through contact so that there is no loss of speed or power.

The muscles in the right forearm that pronate the forearm are the Pronator Teres and Pronator Quadratus. These muscles were first seen in Figure 2-45 , page 26 and are shown for you again in Figure 5-13 on the next page.

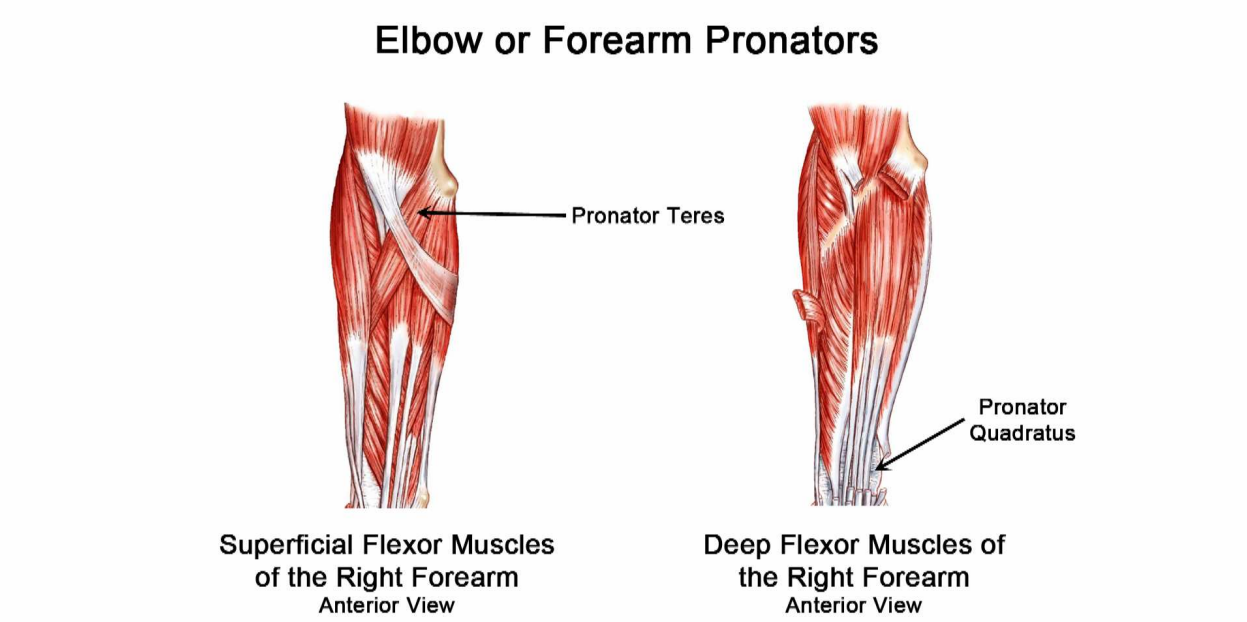


Figure 5-13.

The muscles that that supinate the left forearm are the Biceps Brachii and Supinator. These were first seen in Figure 4-39, page 54 and are shown for you again in Figure 5-14.

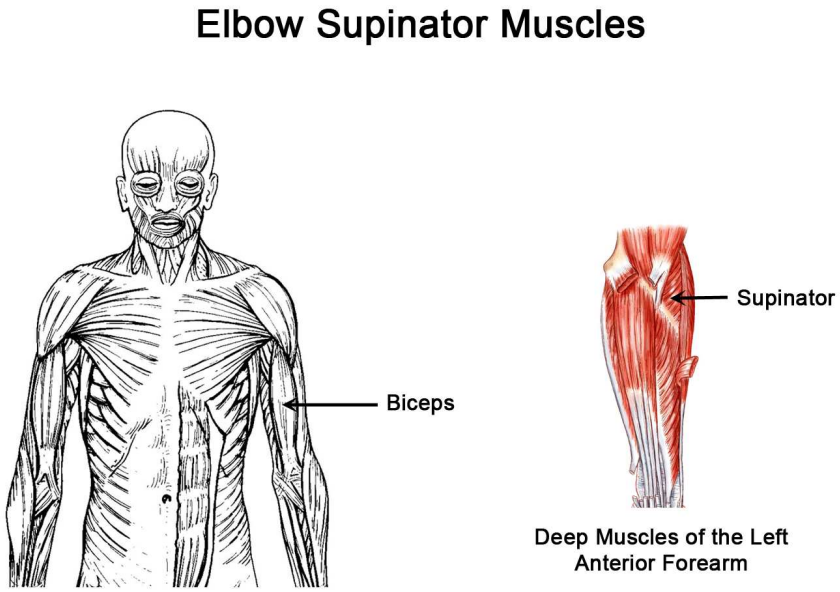
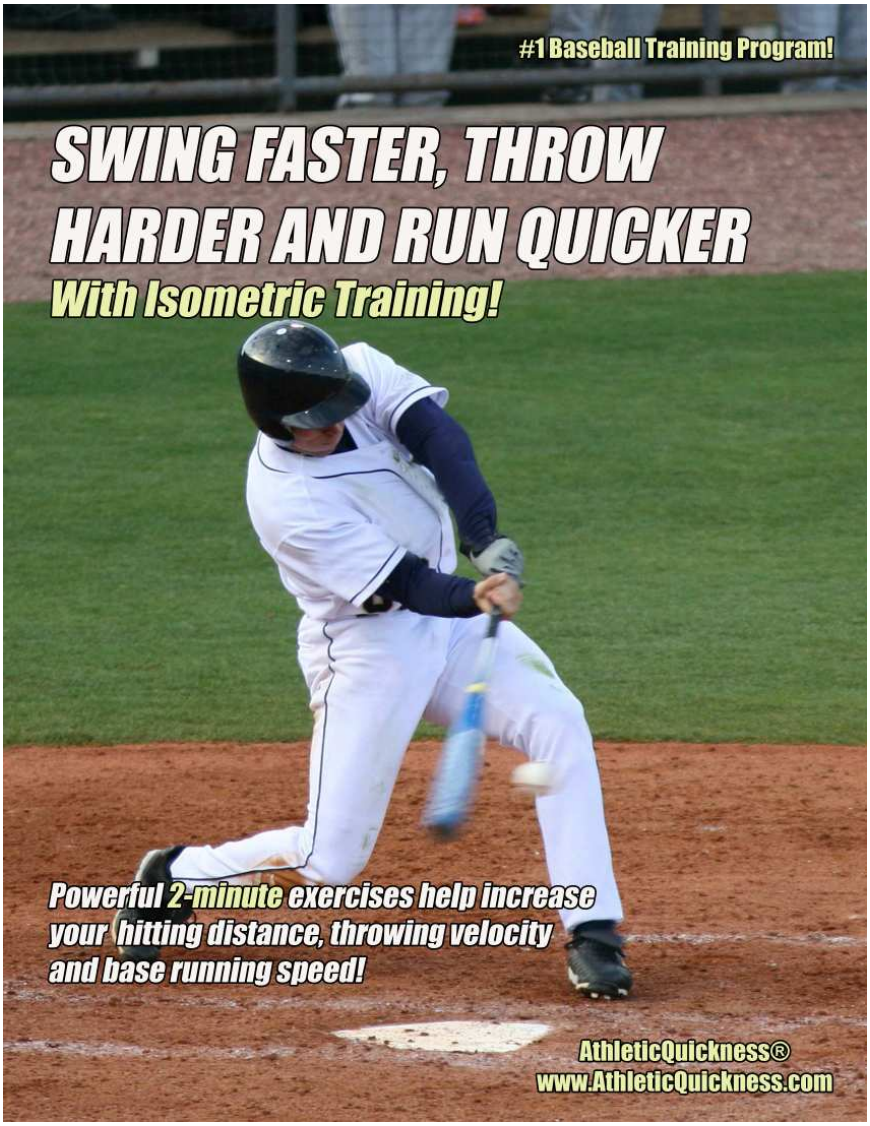


Figure 5-14.

This completes all of the muscles involved in the swing from the loading phase to the launching phase and into the follow through. As you can see, a significant amount of your skeletal muscles are involved. With proper understanding of the role each muscles plays, your training will become more efficient and your batting average should improve.

Appendix

Product Information



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Black	X-Heavy resistance
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Gold	3X-Heavy resistance

*Recommended

Important Notice: It is very natural to want to use the heaviest bands available to get as much resistance as you can. However, a better strategy would simply be to buy the red, green and/or blue bands and then combine them together if you need more resistance. This is because the silver and gold bands are extremely strong and you won't be able to reduce their resistance level if you need to. Just like working out with weights, it is better to have several 10 lb. plates to work with instead of one 100 lb. plate - you have more options. The same applies with the bands.

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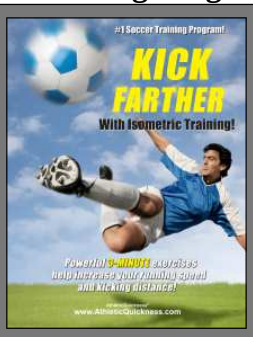

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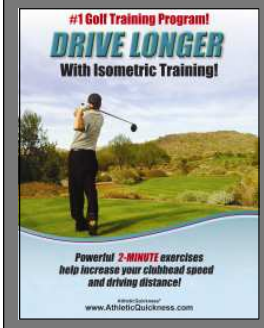

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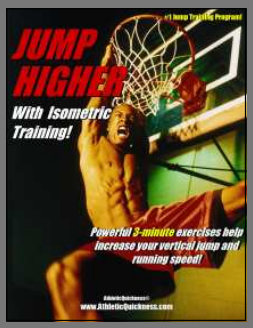

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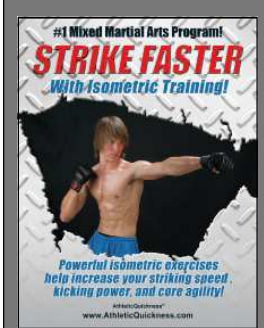

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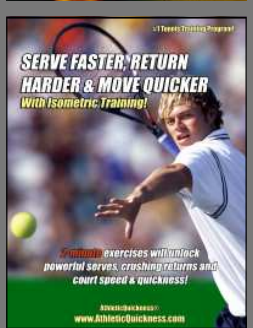

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