Development of Batting

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This skill of hitting a softball approaching the batter at 70 mph with a round bat that is no more than 2.5” wide is one of the most difficult skills in all of sport. It is not surprising that there are only a few highly skilled athletes that can perform such a feat. Although some describe those who can hit a softball at the international level as “natural hitters”, there is enough research and evidence to suggest that hitting can be broken down into measurable parts. There are clear biomechanical differences between those who are successful hitters and those who are not. “Batting is a learned skill! It is not based on any “genetic tendency” (Smith 2001). Focusing on the successful elite hitters, the skill of batting will be broken down into the stance, the coil, the swing and the follow through.

The average time a major league baseball player has to judge the pitch, make a decision and swing the bat is approximately .43 seconds. Softball players at the elite level of play however, have less time – approximately .30-.35 second. As a result of the differences in the time to hit the pitch, there is much debate on the similarities and differences between the baseball swing and the softball swing. This paper will focus on the technique of batting a softball, which may include a shorter and quicker swing than baseball. However, the major movements and the mechanical principles that apply to batting will apply equally well to baseball and softball batting.

Mechanics of hitting

Hitting a softball is accomplished by using a maximum number of body joints, over as large a range of motion possible. The more joints that are used to produce force for the hit, the greater the resulting velocity of the ball. Some of the joints that are important for producing force for the hit include: shifting the weight onto the front foot to start the swing, rotation of the whole body around the front hip (Left hip for right handed batters), rotation of the trunk around the axis through the spine, rotation of the arms around vertical axes through the shoulders as the bat is swung through a horizontal plane, extension of the elbows into the hit, and adduction of both wrists to produce the final velocity on the ball. Each of these body parts must move at the correct time, and in the correct sequence in order to produce maximum velocity at the end of the bat.

Not only must the body parts go through the greatest range of motion possible at each of the joints, but also the movements must be as fast as possible to maximize the speed of the bat (Figure 1: Moment Arm Comparison). The length of the lever arm from each joint to the end of the bat is also critical in producing the greatest speed at the end of the bat. This lever arm, or moment arm (d) is increased as the batter extends the limbs or flexes the trunk, and these lever arms must be optimized in skilled batting. The product of the length of the moment arm and the force applied at each of the joints is known as the torque, and the torque determines how much acceleration is occurring at each of the joints. If force stays constant, increasing the moment arms (d) will
increase the torque as given by the equation $T=Fd\perp$ “The torque needed to accelerate the bat is supplied by the batter’s hips, shoulders, arms, and wrists, each of these rotating in a proper sequence that builds one rotation on another” (Brancazio 1984). Therefore, the major objective in batting is to maximize the lengths of the moment arms of the various body segments from the longitudinal axes through the shoulders, spine and left hip, in order to maximize bat speed (Alexander ??). The greater the angular velocity of the bat when it contacts the ball the greater the linear velocity of the ball. This relationship is described in the equation $V = \omega \times r$; where $V =$ linear velocity of the end of the bat; $\omega =$ the angular velocity of the bat around the long axes of the batter; and $r$ is the radius, or the distance from the left hip of the spine to the end of the bat (moment arm). Therefore increasing either the angular velocity of the bat or the radius from the left hip of the spine to the end of the bat will lead to a greater linear velocity of the ball.

**Figure 1:** Short moment arm versus a long moment arm. Note the extension of the arms in the upper body.

To summarize, the faster the batter swings the bat and the further away from their body they contact the ball, the harder the hit will be. “For the most effective bat-ball contact, the ball needs to be hit through its center of gravity; if it is not, force is lost in added ball spin. If the bat makes even contact with the ball, the ball’s direction is influenced upward if contacted below the center of gravity, and downward if contacted above the center of gravity” (Klatt 1992). There is little room for error when hitting a softball which is why using the most efficient technique that will produce the best, most accurate results is so important.

**Stance**

“The ideal swing is a powerful, intensely focused movement, which is also fluid and graceful. It starts in the stance, before the pitcher has thrown the ball, with some form of internal rhythm and motion” (Lau 1984). Stance is, “the body position adopted by a batter as he waits for the pitcher to release the ball … [it] has a marked influence on the batter’s subsequent actions” (Hay 1993). Since hitting begins from the ground up, the stance is very important. There are a variety of different stances used in softball, but the
parallel stance puts the batter in the best position to hit any kind of pitch and provides the batter with the best base of support for maintaining balance during the weight shift (Figure 2: Comparison of Stances). Another key to a great stance is one that allows the hitter to have a clear view of the pitch which is why a closed stance is not highly recommended. In a closed stance the batter’s front foot is closer to the plate than the back foot, so the hips are rotated slightly back relative to the direction of the oncoming pitch. Although there are several different types of stances observed in softball, there are common characteristics of the stances of good hitters that are noticeable, and make sense from a mechanical point of view. When taking their stance at the plate, all hitters should start by checking the position of their feet and then work their way up.

“In hitting a baseball, a well-balanced stance gives you the foundation you need to build a sound, smooth, and natural swing” (Lau 1984). In a good parallel stance, the feet should be about shoulder width apart or slightly greater (Hay 1993), feet parallel and at a 90-degree angle to the pitcher. Depending on bat size and size of the player, where the player stands in relation to the plate will change, however a few key criteria need to be met. The batter should be close enough to the plate to be able to cover the outside edge of the plate when the player is fully extended but also far enough away that the player can comfortably hit the inside pitch. In addition to how close to the plate the batter must stand, the batter must also consider how close to the pitcher to stand (how far up or back in the batter’s box to stand). Ideally, the batter would prefer to stand up in the box to make contact with the ball before it breaks (if pitch is anything other than a fastball). It is also easier to cut-off the angle of an inside or outside pitch and increases the chances of hitting the ball in fair territory. However, standing up in the box gives the batter less time to decide and swing the bat (Stockton 1984). Standing closer to the catcher (back in the box) permits the batter to see the ball longer and take more time to decide whether to swing or not, but also allows the ball to move and break more and increases the chances of hitting the ball foul. Often, elite batters will stand even with the plate, however many good batters will assume one of the extreme positions in front of or behind the plate.
“To be truly balanced in your stance, you must have your feet set apart, your knees flexed, and your body bent slightly at the waist” (Lau 1984). In this position, the ankles should also be dorsiflexed. In addition, balance can only be maintained if the batters keep their centre of gravity within their base of support. Therefore, in order for a weight shift to occur (that will be discussed later), the athletes have to keep the majority of their weight over their back leg – still within their base of support as this will give them room to shift their weight forward while maintaining balance, and also helps load the back leg. As previously mentioned, the knees should be slightly flexed and the hips should be slightly flexed, or in other words, the batters, “should lean slightly towards the plate” (Stockton 1984). The shoulders are abducted and both elbows should be flexed with the back elbow slightly higher than the front elbow with the forearms forming an “A” (Figure 3: “A” Formation). The hands should be slightly higher than shoulder height with the peak of the “A” slightly higher, and in front of the back shoulder (shoulder closest to the catcher). The athlete should not be gripping the bat very tight. Charlie Lau suggests that when gripping the bat, a good hitter does not want white knuckles (1984). White knuckles are an indication that the grip is too tight and there is unneeded tension present in the fingers and hands which spreads further to wrists, arms and shoulders. If the muscles are already contracted, they will not be able to react quickly enough when the time is needed. “The force with which a hitter can ‘throw’ the bat at the ball is directly related to the degree of relaxation maintained in the hands, wrists, and forearms (Stockton 1984).

The importance of staying relaxed at the plate cannot be emphasized enough. The position of the head is also very important as it will determine how the athlete visually picks up the ball. Keeping the head steady and moving in the same horizontal plane throughout the stance and the swing is one of the most important movements batters can do to increases their chances of hitting the ball. Everything the eyes see is interpreted by the brain and if the batter keeps the head still and level throughout the stance and swing, the brain will not have to adjust to varying conditions and this will make it easier for the athlete to read and focus on the ball. “Keeping a steady head and tracking the ball with the eyes stabilizes a batter” (Klatt 1992).

The position of the bat should be around at a 45-degree angle (Figure 4: Bat Angle) (Arzola 1996; Unknown 2002). “In order to hit a pitch, the bat has to be on the same plane as the ball…When the bat is held at 45°, it’s closer to this parallel position – so can get there faster – than a bat that’s held at 90°” (Unknown 2002). The 45-degree
angle in this case refers to the angle of the bat in relation to the horizontal as the end of the bat is posterior to the head. The forty-five degree angle is observed from the pitcher and catcher’s point of view. Once the batter has settled comfortably into the stance, the pitcher begins to throw the ball and the batter takes the stride.

**Figure 4**: Bat angle of nearly 45 degrees in preparation for the ball.

*Stride*

There are three purposes of the stride. The first two purposes are to serve as a timing mechanism for batters and also as a reminder to batters to keep their body weight back (Russo 1998). As the athlete picks up the front foot (foot closest to the pitcher) the batters are forced to keep their weight on their back foot. The athlete then places the front foot down no more than six inches – regardless of the athlete’s size, in the direction towards the pitcher (Klatt 1992 recommends 6-10”). “The stride should be 6 to 10 inches in length, and the stride foot should land in the same location for every pitch, regardless of whether the pitch is high or low, inside or outside” (Klatt 1992). The reason for the short stride is that a stride any greater than this will cause the athlete’s head to move too much changing the way the athlete sees and interprets the ball. In addition, the athlete cannot begin hip rotation until the stride is complete and considering the importance that hip rotation provide in force production, a short stride is recommended to allow the hip
rotation to occur earlier (Klatt 1992). The front foot should be planted with the toe slightly closed (not directly pointing to the pitcher) so that the hips will remain back and not prematurely open (Figure 5: Foot Positioning). Furthermore, a shorter stride is easier for batters to control their forward motion and maintain balance (Russo 1998). The batter’s weight must still remain back at this point. “As the stride foot lands, the hands and body weight must remain back until the swing brings everything forward” (Russo 1998). Another purpose of the stride is to contribute to the backswing. Many elite hitters actually use the stride to shift their weight back and get into a more “coiled” position to help put all the muscles of the back, torso and shoulder on the side closest to the pitcher on a good stretch. The better skilled hitters show very little vertical deviation in the path of their centre of gravity as their linear movement forward is occurring. Therefore, as the front foot strides toward the pitcher, the more the upper body “coils” and rotates away from the pitcher as the batters move more into their backswing.

![Figure 5: The front foot is angled away from the pitcher to prevent the batter from opening up too early.](image)

**Backswing**

The main purpose of the backswing is to place all the necessary muscles that will be used to accelerate the bat on a pre-stretch to activate the stretch reflex. The main movement that occurs during the backswing aside from the weight shift is trunk rotation towards the catcher (Figure 6: Muscle Stretch in preparation for contact). The major muscles stretched during the backswing are the gastrocnemius (calf muscle on the back leg), quadriceps, gluteals, and posterior deltoid of the shoulder closest to the pitcher along with the rhomboids and trapezius (back muscles) and the external and internal obliques, serratus anterior and the triceps (on the arm closest to the pitcher). During the backswing, the athlete rotates away from the direction of the ball, thus increase the range
of motion that the athlete has to rotate before ball contact. The greater this range of motion is the greater the distance the athlete has to rotate and generate more angular velocity on the bat. In other words, the more power can be generated as force is applied over a greater distance. Keeping the bat in motion is also important to the batter during the backswing that way when the hitter wants to initiate the swing the inertia needed to overcome is decreased as explained by Newton’s first law. Newton’s first law states that, “A body will maintain a state of rest or constant velocity unless acted on by an external force that changes the state” (Hall 2003). At maximum backswing, elite hitters have their lead arm extended and across their chest with their back elbow still flexed. The back leg is flexed (“coiled”) ready to extend and help drive rotation of the hips and the front leg is extended ready to stop the linear movement forward. In softball, there are currently two schools of thought: One is to use a backswing as they do in baseball with rotation away from the pitcher, and the second one is not to use a backswing and “coil-up” in the initial stance. Most elite hitters use the backswing described above.

Swing

As the front foot finishes its stride and is firmly planted, the same knee is in an extended position to stop the forward movement of the athlete’s centre of gravity. “The front leg produces a counterforce that causes the pelvis to rotate forward, followed by trunk rotation” (Klatt 1992). The back foot pivots internally rotating the back leg and the hips are then brought through as fast as possible as the athlete rotates about an axis through the front hip, longitudinally through the front straightened leg. The trunk that has remained back as much as possible begins rotating through the longitudinal axis of the trunk once the hips have finished rotating. The front shoulder and the arms remain back as long as possible until the trunk finishes rotating and then the arms and the final wrist snap occur. The bat remains back due to inertial lag and does not begin to rotate around until the arms start to come through. The bat is the last thing to come through. The batter brings the hands inside the path of the ball and focuses on hitting the ball with the sweet spot of the bat. The trunk leans forward over the plate during the swing, and reaches a point of greatest forward lean at impact increasing the length of the moment arm for rotation around the front hip. At the moment of impact, the distance from the spine and the left hip to the ball is at near-maximal levels due to the trunk lean, abducted

Figure 6: Notice how the batter rotates her trunk back towards the catcher
shoulders, extended elbows, and abducted wrists at impact. Contacting the ball when the hitter is in this position will also increase the lengths of their moment arms which will lead to the maximum torque being generated. The greater the torque, the greater the angular velocity that is generated as given by the equation \( T = I \alpha \) where \( T \) = torque, \( I \) = moment of inertia and \( \alpha \) refers to angular velocity. The hands should lead the bat in the swing and wrists should remain cocked until the moment just before ball contact where the batters snap their wrists. The batter does not roll the wrists over until after ball contact and the follow through phase. “…The arms roll over and wrists snap through on the follow-through” (Klatt 1992). Consequently, a good hitter will have segmental body rotation having the angular velocity generated by one segment transferred to another segment resulting to an accumulated torque that is then transferred to the bat creating a very high angular velocity. Alexander 2004 provides a chart by Christian M. Welch, Scott A. Banks, Frank F. Cook and Pete Draovich that has average angular velocities at the end of each segment’s rotation.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean (degrees/second)</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip segment maximum rotational velocity</td>
<td>714</td>
<td>76</td>
</tr>
<tr>
<td>Shoulder segment maximum rotational velocity</td>
<td>937</td>
<td>102</td>
</tr>
<tr>
<td>Arm segment maximum rotational velocity</td>
<td>1160</td>
<td>96</td>
</tr>
<tr>
<td>Bat lag maximum segment rotational velocity</td>
<td>1588</td>
<td>162</td>
</tr>
</tbody>
</table>

**Critical Instant**

Critical instant is the instant when the bat hits the ball. It is, “the point that determines the skill’s efficiency” (Alexander 2005). Elite hitters will make impact with the ball when the bat is at peak angular velocity. As the benefits of extending the arms at ball contact have been discussed, highly skilled hitters are able to hit the ball with extended arms no matter where the pitch is. The most difficult pitch to hit with fully extended arms is the inside pitch. Therefore, elite hitters make contact with the ball well in front of the plate where the arms are able to fully extend and maximal angular velocity of the bat is achieved. This requires a very quick swing as the athlete has to recognize the pitch earlier in order to get in a full swing in the shorter amount of time. Also at critical instant, elite hitters unweight their back leg and the toes on their back foot face toward the pitcher. (Figure 7: Batter has...)

**Figure 7**: Batter has unweighted her back foot in preparation for the critical instant.
unweighted her back foot in preparation for the critical instant). At critical instant, the back knee is flexed about 90-degrees and the thigh is perpendicular to the ground. In addition, full hip, torso and shoulder rotation have occurred and the athlete should still be stable and balanced. Contrary to old belief, it is near impossible to “watch the ball hit the bat”. A batter is only able to see the ball within 3-5 inches of the plate (Klatt 1992). “For the eyes, close is good enough. More precisely, the eyes need only get to a position in the general vicinity of the target area to provide the manual system with visual information about the relative positions of the hand and the objects the hand touch/grasp”(Binsted 2001). This is another reason why good hitters hit the ball out in front of them.

Follow Through

The follow through includes all the body movements which occur after the critical instant in order to slow down the body parts gradually over the longest range of motion to prevent injury. In the softball swing, this includes everything that happens after the ball has contacted the bat. If a hitter does not swing through the ball, it is an indication that the hitter began slowing down the movements before the critical instant, thus the angular velocity obtained by the previous movements is not fully transferred to the ball. It is immediately after the critical instant and in the follow through that the wrists roll over and the position of the hands is reversing. The bat’s momentum will then pull the arms through to finish the follow through. Both arms move across the batter’s chest both fully extended, the torso and shoulders continue to rotate away from the plate and the hitter moves the head to track the ball. The lateral rotators, posterior deltoid and the back side of the torso now eccentrically contract along with the internal and external obliques and serratus anterior of the side facing that was previously closer to the catcher. This all takes place as the centre of gravity is slowly moving back towards the catcher and the base of support is increased. The longer the follow through, the greater the range of motion of the limb segments and the greater the distance the eccentric contractions and deceleration can occur which will help decrease the chances of injury. Charlie Lau is a fan of releasing the top hand from the bat and following through with the one arm instead of two. It is not uncommon however for most elite softball players to continue to follow through with both hands on the bat. However, if the batter does make contact and the ball is put into play, the quicker the batter completes the follow through and gets out of the batters box the better chance of reaching first base safely. “…a left-handed batter’s swing results in his momentum going towards first base. A left-handed batter will be able to start more quickly and be able to reach first base faster” (Smith 2001). The follow through for right handed batters will take them away from first base and as a result, may be forced to shorten their backswing more so than left-handed batters. Consequently, the batter must compromise one or the other – this is for the batter to find the best equilibrium possible.

Other factors common in elite hitters

One common characteristic of elite softball hitter is experience. “An experienced batter who has seen numerous speeds and breaks of pitches delivered by different types of pitchers in a variety of past situations is more likely to correctly identify the speed and break of the next pitch. This is in part due to the fact that he has learned to anticipate
what certain pitchers are likely to throw in specific situations (which is probably why experienced batters sometimes report having more difficulty with pitchers they have never faced before)” (Wrisberg 1992). “To facilitate this capability in your less-experienced batters, you should expose them to a wide variety of pitches and pitchers during practices. The more at bats they get against different pitchers, the better they will become at anticipating, reading, and reacting to the pitch” (Wrisberg 1992). -anticipation plays a major role in the hitting of a baseball. Experience is what determines a batter’s accuracy based on better anticipation of predicting ball placement – the more experience, the better (finding the reference).

Long-term athlete development of batting

“Learning to bat is a learned skill! It is not based on any “genetic tendency” (Smith 2001). Payne has outlined some of the differences between skilled batters and more advanced batters (2002).

<table>
<thead>
<tr>
<th>Inexperienced Batter</th>
<th>Advanced Batter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Striker usually takes no step, but if the striker does, it is with the homolateral leg.</td>
<td>1. Striker takes a forward step with the foot opposite the striking arm or striking side.</td>
</tr>
<tr>
<td>2. Striker uses an up-down striking motion.</td>
<td>2. Striker uses a full backswing.</td>
</tr>
<tr>
<td>3. Striker takes little backswing with the striking arm or implement.</td>
<td>3. Striker swings the striking implement horizontally.</td>
</tr>
<tr>
<td>4. The striker’s trunk and hips do not rotate and there is no block rotation.</td>
<td>4. Differentiated trunk and hip rotation is present.</td>
</tr>
<tr>
<td>5. Striker holds the arms rigid with little, if any, wrist snap when swinging a paddle or bat</td>
<td>5. In the two-handed striking pattern, the striker’s arms are relaxed and there is a noticeable coordinated wrist snap when swinging bat.</td>
</tr>
</tbody>
</table>

At what stage in the Long-term athlete development plan that a young softball player begins to exhibit the more advanced hitting technique is the question. Extensive observational research has been done in the area and is broken down into the developmental stages as outlined in the Canadian national long-term athlete development plan (Smith 2005).

**Stages of Development in Batting**

Active start (0-6)

When a child in this developmental stage first picks up a bat, the question is, which way will the child swing – Left or Right? There are a few things to consider when placing the bat in a child’s hand. First of all, “A small percentage of children do not seem to have a dominant hand for a few years, but then become right or left-handed naturally, without any instruction” (Smith 2001). If no dominant hand is evident, some experts believe that children should be taught to bat left-handed right off the bat because of the advantages left-handed hitters have over their right-swinging counterparts. Aside from being able to get out of the batter’s box easier, another advantage is that left-
Swinging batters have a better angle to hit the ball coming from a right-handed pitcher. Due to the high percentage of right-handed pitchers batting left-handed, this makes more sense. Furthermore, the importance of vision should be considered when determining what side the child should hit from. “People who are right-handed predominantly have right-eyed dominance and people who are left-handed similarly have a left-eyed dominance” (Smith 2001). However, if a right-eye dominant hitter bats right-handed, then this means that the batter’s dominant eye is further from the pitcher. Subsequently, Smith (2001) suggests that “…right-handed people should bat left-handed because their dominant eye would then be closer to the pitcher. This would, therefore, provide a clearer view of the pitcher and of the approaching ball than if they were batting right-handed”. Contrarily, Spurgeon et al. (1989) have found in their study that there was no difference in batting if same dominance (left eye dominant batting left) and mixed dominance (left eye dominant batting right). If the child already shows a dominant side, then there is literature suggesting that the dominant hand should be the top hand. “A right-hander naturally has more precise control and positioning accuracy when using his right hand for any task. In swinging at a pitch, a batter pulls the bat with his left arm, and pushes it with his right; thus the left arm supplies more of the accelerating torque, while the right arm steers” (Brancazio 1984). Either way, coaches and parents should be careful when trying to teach a child to hold a bat and swing, and ultimately let the child try batting from both sides of the plate to allow the child to naturally choose which way to hit, rather than being forced one way or the other.

After children in the active start stage pick up the bat, it is important for coaches and parents to be aware of some common characteristics they may see when working with children in this age group. “[At] an inexperienced level of development, a child usually directly faces the object to be struck and may or may not take a forward step. If the child does take a forward step, it is with the homolateral leg, the leg on the same side of the body as the striking arm. Thus, all the striking movements are accomplished in the anterior-posterior plane.” (Payne 2002). In other words, the movement of the swing is more like a chopping motion and is more of an up and down motion taking place in a vertical direction rather than a horizontal motion. Somewhere within this age group however, “the child’s upward-downward swing pattern gradually “flattens out”” (Payne 2002). At what age this occurs is not exactly known due to individual developmental differences, but most children will be able to swing the bat in a more horizontal plane (although not perfectly horizontal) aside from the slower learners. As the swing flattens out, the chances of the child hitting the ball successfully will increase as well. “Flattening out the swing facilitates the child’s ability to contact the ball. In most instances, this sidearm striking pattern becomes well defined by approximately 36 months (Espenschade & Eckert, 1980)” (Payne 2002). 60% of children 5 years of age will turn their body to sideways to the pitcher. Seedfeldt and Haubenstricker’s 1982 developmental stages of batting are shown below in Figure 8 (taken from Payne 2002). Children in the Active Start stage usually belong in Seedfeldt and Haubenstricker’s stage 1. Advanced children in this age group may display batting characteristics similar to stage of the developmental model. As outlined in the developmental model and observation of children in the Active Start stage, batting characteristics of children are as follows:
Characteristics of Batting at this Stage:

- Not all children know how to hold the bat nor what side of the plate they prefer to be (Swinging left or right handed has not been determined for all children early in this stage).
- Batter is often facing the oncoming ball, with the feet and shoulders facing forward in the ready position or has a very open batting stance.
- Grip on the bat is with the hands apart and usually choking up from the handle
- Swing is more anterior-posterior (more in a vertical plane than horizontal)
- Step is often taken onto the back foot instead of onto the front foot, which brings the body around to face more squarely forward rather than being sideways
- There is very little hip rotation or trunk rotation in the direction of the hit, trunk usually remains facing forward during the swing
- Trunk extension actually observed as child moves away
- Swing is made with the arms only, and often swing is in an upward downward direction rather than horizontal
- Elbows are often kept flexed during the swing, decreasing the length of the lever arms and decreasing bat speed
- Player often closes the eyes as the ball approaches the bat, so eyes are closed at the point of contact and just before contact
- Backswing is very short and the follow through is often quite long
- Feet usually remain stationary (some children will take a step towards an outside
**Stage 1**  The motion is primarily posterior-anterior in direction. The movement begins with hip extension and slight spinal extension and retraction of the shoulder on the striking side of the body. The elbows flex fully. The feet remain stationary throughout the movement with the primary force coming from extension of the flexed joints.

![Stage 1 Diagram](image1)

**Stage 2**  The feet remain stationary or either the right or left foot may receive the weight as the body moves toward the approaching ball. The primary pattern is the unitary rotation of the hip-spinal linkage about an imaginary vertical axis. The forward movement of the bat is in a transverse plane.

![Stage 2 Diagram](image2)

**Stage 3**  The shift of weight to the front-supporting foot occurs in an ipsilateral pattern. The trunk rotation-derotation is decreased markedly in comparison with stage 2, and the movement of the bat is in an oblique-vertical plane instead of the transverse path seen in stage 2.

![Stage 3 Diagram](image3)

**Stage 4**  The transfer of weight in rotation-derotation is in a contralateral pattern. The shift of weight to the forward foot occurs while the bat is still moving backward as the hips, spine, and shoulder girdle assume their force-producing positions. At the initiation of the forward movement, the bat is kept near the body. Elbow extension and the supination-pronation of the hands do not occur until the arms and hands are well forward and ready to extend the lever in preparation to meet the ball. At contact the weight is on the forward foot.

![Stage 4 Diagram](image4)

**Figure 8:** Seedfeldt and Haubenstricker’s developmental sequences for striking with a bat: toal body approach (1982) (Payne 2002)
FUNdamentals (6-9) (6-8)

Within the FUNdamentals stage, 80% of children will correct their stance by properly facing the non-dominant side of body towards the tosser – usually around the age of 7 (Ulrich 2000). Other characteristics observed within this stage include:

**Characteristics of Batting at this stage**

- Batter is now sideways to the oncoming ball, and watches the path of the ball over the front shoulder from the ready position
- Bat may still be being held with the hands apart; but bat position is more upright to start and more horizontal during the swing
- Some children will shift their weight forward onto the front foot during the swing, so the weight actually moves from over the back foot to over the front foot – others will continue to keep their weight on their back foot.
- Those who do properly transfer their weight forward do not always stride, but rather flex their trunk forward towards the pitcher instead.
- The back foot is unweighted after contact, so most of the weight is over the front foot
- Often show trunk rotation forward into the hit, although it is not segmented trunk rotation but both the shoulder and spinal rotation occur at the same time
- Bat is swung in a horizontal plane, but timing of elbow extension and wrist adduction may not be optimal- these movements may occur simultaneously instead of in sequence.
- Block rotation (hips and shoulders rotate together) is more common than segmental rotation in this stage of development.
- Elbows still remain flexed throughout the swing (not as much as observed in the Active Start stage).

Learning to Train (9-12) (8-11)

Batting milestones that occur within this stage is better hip and spine rotation and more of a weight transfer from the back foot to the front foot. Ulrich has concluded through his research that 60% of eight year olds display adequate hip and spine rotation (the swing is no longer just in the arms and upper body, and 80% of children by the age of nine. By age eight 60% of the children observed transfer their weight forward using a stride towards the pitcher while 80% of children by the age of 10 (Ulrich 2000). Advanced children in this age group will be able to generate lots of power from this hip rotation and will also show a very good segmental rotation. The weaker hitters in this age group will still swing with block rotation (hips and shoulders all swing as one).

**Characteristics of Batting at this stage**

- Players now are now observed to unweight the back foot as proper weight transfer occurs.
- Players will use a backswing.
- Segmental rotation of the segments is observed to occur however there are timing issues.
- Front leg appropriately blocks the hips and the athlete has a more balanced swing
- Swing remains inconsistent
- Follow through is nice and long
Training to train (12-16) (11-15)

Hitting a variety of different pitches and different speeds while maintaining the same mechanics should be emphasized with batters in this developmental stage.

**Characteristics of Batting at this stage**

- A mature batting technique with similar mechanics of those described above can be observed in this age group – dependent on playing experience and previous coaching influences.

Training to Compete (16-23 +/-) (15-21 +/-)

- Hitting to the holes

Training to Win (19 +/-) (18 +/-)

- The elite technique as described earlier should be evident by this age group along with more situational hitting to different parts of the field.

Active for Life (any age)
Bibliography


