This article is a review of gymnastic twisting techniques with an emphasis on uneven parallel bars. Once again, I need to start with some basic definitions. In this article, flipping is defined as rotation around an axis that is oriented in a left-right direction relative to the gymnast (Figure 1). In free flight, the axis goes through the center-of-mass (COM) of the gymnast (roughly at the level of the mid lumbar/belly-button region in a standing individual). During giant swings, this axis goes thought the hands and is defined by the bar. If the gymnast were to release the bar, then this axis translates to their COM as the body continues to flip. Movements around this axis occur in the sagittal plane. – Twisting is defined as rotation around the long axis of the body (Figure 2). This axis can be visualized by drawing a line from the top of the head down through the bottom of the feet. Movements around this axis occur in the transverse plane. For completeness, the third and final axis can be visualized as projecting through the body from front to back. Movements around this axis occur in the frontal plane. Skills in this plane include side-saltos. These skills are not typically associated with uneven parallel bars, so this axis/plane will be ignored.

**CONSERVATION OF ENERGY:**

A large part of any bar routine involves the creation and conservation of energy. This energy is often described as angular momentum. It is related to the gymnast’s swinging speed (angular velocity) and weight distribution (COM). In short, longer bodies flip slower than more compact bodies in the absence of external forces. A giant swing is simply a flip around a fixed axis (the bar). But in a giant swing, the bar presents an external force and therefore can influence the energy.
in this “system”. A gymnast can control this energy by adjusting body shape and applying pressure to the bar in various phases of the skill. As an example, changing body shape during the 1st half of the giant can act to store energy that is released during the 2nd half (Figure 3). This energy can be used to create long axis twisting during giants and release skills. What follows is a discussion that includes some basic progressions and some things to avoid.

TYPES OF TWISTING ELEMENTS:
There are many ways to classify twisting elements. Two potential categories of long axis twisting in any bar routine include; (1) those that occur on the bar (pirouettes, blind changes and their derivatives), and (2) those that occur when leaving the bar (release skills and dismounts).

Don’t underestimate the importance of a tap swing or kip in assisting the long axis twist. Both store energy in the bar and contribute to the angular momentum of the gymnast. The body shape change in the tap swing moves the COM away from the bar as the gymnast falls, storing elastic potential energy in the bar. The stretched position during a kip performs the same function. In both of these skills the gymnast shortens their body, increasing their angular velocity. The energy stored in the bar is released at this point in a direction opposite storage, so timing is important. This energy can be used to increase the angular velocity of the gymnast which can then be transferred from the flipping axis to the twisting axis.

BAR-INITIATED TWISTS:
Bar initiated twists are defined as twists that start while the gymnast is still in contact with the bar. They result from support surface imbalances that produce left-right asymmetries in the gymnast. Twisting always occurs due to left-right asymmetries. Examples of twists that occur when the gymnast is under the bar

- Releasing the bar one hand at a time in quick sequence allows gravity to initiate the twist. Examples include bail-to-shoot-over and a twisting back salto dismount. These skills can be done under the bar and produce a long axis twist as the unsupported side “falls” due to the force produced by gravity. Release timing is obviously important since gravity only pulls downward.

Using this technique during full twisting dismounts allows twist initiation prior to releasing the bar. The gymnast then has less twist to complete during the airborne phase of the skill. The problem with this technique is that is does not teach the gymnast to elevate the dismount. It may not lend itself well to progression to multiple twists and often develops habits that are counter to an understanding of airborne twisting mechanics.
Examples of twists that occur over the bar

- A kip-pirouette utilizes the energy stored in the bar to initiate forward flipping momentum. As the gymnast opens the shoulders and hips into handstand, twist is initiated along the long axis of the body in line with the supporting arm. This technique is similar to late-phase twisting described in a previous article (Twisting basics I: floor exercise). The pike-to-open position initiates twisting on the post arm. The stored bar energy helps with twist initiation prior to a handstand position.

- A blind change (or reverse pirouette) can be initiated using a free-hip or tap-swing to transfer rotation energy to long-axis twisting energy. The gymnast should be careful to keep the head neutral and not open the hips beyond a neutral position since this arched shape slows the twist. Tap-swing twisting drills may help promote the correct mechanics safely.

NON BAR-INITIATED TWISTS

These are twists that are initiated by body asymmetries after the gymnast leaves the bar. It is important to note that the angular momentum is constant once the gymnast is in free-flight. All the gymnast can do is manipulate their body shape to change angular velocity and transfer energy between the flipping to the twisting axes. This is probably best explained by introducing the concept of moment-of-inertia (MOI). This relates to an object’s “willingness” to rotate. Bodies whose mass is concentrated close to the axis of rotation tend have a lower MOI and rotate faster than bodies whose mass is farther from the axis of rotation (higher MOI). In other words, a tuck salto will flip faster than layout salto if given the same take-off energy. How you convert this flipping energy to twisting can be described in the following way.

Consider the body to have symmetry. The left and right halves are a mirror image of each other. Twisting will not occur if both left and right halves of the body have the same MOI. Consider a layout dismount from bars. The body shape immediately after release is with the arms up and shoulders in an open position. This ensures that the gymnast will not rotate back into the bar and hit their feet. During the rotational phase of the skill, the gymnast often lowers both arms to their sides, allowing the flip to increase in speed (reducing the MOI). As they approach the landing mat, the arms can be raised slightly, slowing the body. As an aside, you may also see the gymnast pike prior to landing if they did not leave the bar with enough flipping energy. This, again, decreases the MOI and increases the flip speed and allows the gymnast to land on their feet. This entire sequence happens (and is taught) with left-right symmetry.

To initiate a long axis twist, the gymnast must develop a left-right asymmetry during the airborne phase of the skill. This can be as simple as dropping only one arm. During a back flip, if the right arm is dropped, then the right side of the gymnast will flip faster causing twisting to the right. As a

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this is probably easiest to think about by standing on two feet and imagining a back flip from your shoulders perspective. Both shoulders would move backwards at the same rate. If your right shoulder were to move backwards faster than your left, then the flip would also include a long axis twist to the right.

I often have the gymnast learn this concept in reverse; if dropping the right arm initiates a right twist when you start with both arms up, then raising the left one should do the same thing if you start with both arms down. It does. So, if you have the gymnast perform a layout and instruct her to raise her left arm just before floor contact. The result will be a right twist (typically ¼ or ½). Once they understand the mechanics, you can progress their kinesthetic awareness and have them begin to initiate the twist by dropping the right arm after leaving the bar. To continue to full twists, you simply instruct them to follow the dropping right arm with the left, but have the left arm cross midline. This again continues to bias the asymmetry in the body and increases the twisting speed.

One potential problem to consider is the gymnast's desire to add more speed to the skill. Some gymnasts will naturally try to increase their angular (flipping) velocity (and thus their angular momentum) prior to release by closing their shoulder angle. Typically termed “pulling in”, it can frequently be seen in novice gymnasts learning a tuck salto dismount or in more seasoned gymnasts when first learning twisting dismounts. The non-bar initiated twisting technique is often employed to minimize the potential for pulling into the bar prior to release. To avoid over rotated landings during twisting dismounts, the gymnast should be instructed to avoid closing their shoulder and hip angle as the second arm comes in. This will reduce the potential of the gymnast missing their feet on landing.

SUMMARY
One important concept all gymnastics skills have in common is that once the body is airborne, it only has the energy it left the apparatus with. The typical bar progression for twisting includes advancing saltos from tuck to pike to layout and over rotating layouts to ensure that the gymnast will have enough energy to give some to the twist and still complete the flip. During skill development, a coach may provide the additional energy in the form of a spot. This may assist the gymnast in understanding the kinesthetics of the skill while still in the learning phase. Spotting compliments the drills.

Progression is key; a gymnast should not attempt an advanced salto until they have mastered the base skill (e.g. first learn a controlled or slightly over rotated tuck or pike salto prior to attempting a layout). This issue becomes more poignant when progressing to multiple flips and twists. A twisting double salto dismount should never be attempted until the gymnast is proficient with the base skill. – When the gymnast is ready, then teaching the twist progression in the later phase of the flip may reduce the potential for the gymnast to pull-in to the bar.

The twist can be initiated after bar release by creating a left-right body asymmetry. On a backwards flipping skill, dropping the arm on the side of the desired twist transfers energy from the flipping axis to the twisting axis. A double back can progress to a double back ½-out using this technique. Dropping the arm sooner produces a ½-in double front which can then be progressed to a ½-in ½-out (or full twisting double back). Once the gymnast is competent, then the twist can be placed in different phases of the flip. Care should be taken when attempting to place the full twist in the first flip rotation (full-in) since it often increases the potential for the gymnast to pull-in on the bar prior to release.

IMPORTANT POINTS
• Twisting occurs from left-right imbalances.
• Stretching during kips and swings stores energy in the bars that can be used by the gymnast.
• Head position is extremely important during twisting.
• Visual cues should be used to promote good body alignment and twist timing.

References: