



Hruska Abduction and Adduction Lift Tests as Related To the Gait Cycle

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In a nutshell, the two tests determine if one can attain bottom leg early/mid stance control (AF IR) while the top leg is performing frontal plane ABDuction or ADDuction of the pelvis and femur (in a position of AF ER), without losing tri-planar control of the bottom side (AF IR).

Hruska ABDuction Lift Test - Tests terminal stance phase of top leg and late swing/early heel strike of bottom leg

1/5 – Bottom side thoracic ABD with bottom side AF IR because the top side is performing AF ER. I believe the bottom side is performing a feed forward activity during the entirety of this test in preparation for heel strike.

An inability to perform this stage, which would correspond to a 0/5 score, indicates (among other things) a possible lack of bottom side oblique control of thoracic abduction, an inability to attain a bottom side ZOA, the top side adductor magnus may need to be inhibited, bottom side paraspinals may need to be inhibited, or the top side IO/TA may need to be inhibited. The bottom side frontal plane IO/TA (for thoracic-acetabular ABDuction) will need to be recruited first and maintained during the entirety of this test.

This is linked to terminal stance of top leg and late swing of bottom leg.

2/5 – Bottom side FA ADD and IR to relative neutral while in position of AF IR. Need to use the medial hamstring and IC ADDuctor of the bottom leg while maintaining the bottom side IO/TA for thoracic abduction for disengagement of the top side ab wall (IO/TA) and adductor magnus.

An inability to perform this stage indicates a possible lack of bottom side hamstring and IC ADDuctor for FA IR and FA ADD to neutral while in a position of AF IR, a lack of bottom side IO/TA's maintenance of bottom side AF IR, tight bottom side posterior hip capsule, the top side adductor and ab wall may require inhibition, or bottom side paraspinals that may need to be inhibited.

This corresponds to late swing with bottom side medial hamstring and IC ADDuctor as they prepare to end swing and begin stance phase of the bottom side. The bottom leg will need to stop performing the FA ER that it is doing during mid swing and prepare for heel strike by engaging the muscles required to pull the femur from ER to neutral, and then to IR.

3/5 – Top Leg AF ER with FA IR for terminal stance while maintaining bottom side medial hamstring, IC ADDuctor, and obliques to prepare for heel strike. The top leg is replicating late stance through the medial arch (FA IR) while performing AF ER with the top side gluteus maximus as the primary AF ER stabilizer. This part of the test is to see if one can perform bottom side thoracic abduction, bottom side AF IR/FA ADD and FA IR to neutral, while in a position of top side AF ER and FA IR.

An inability to perform this stage indicates a possible lack of ability to perform FA IR in a position of AF ER of the top leg, which is either due to lack of bottom side IO/TA control, tightness in top side posterior hip capsule (the top side femur should perform FA IR, as long as the position of AF ER is maintained, with relative ease due to normal capsule, ligament, and joint mechanics), or overactive top side TFL, which will need to be inhibited.



Due to normal osteokinematics and intact anterior hip ligaments, the top leg FA IR portion of this test should not be difficult unless the top side TFL is engaged, which is an indication of a loss of bottom side thoracic abduction, or over-activity of the top side IO/TA. This test corresponds to the terminal stance phase of gait of the top leg as the bottom leg continues to prepare for heel strike.

4/5 – The top leg is performing frontal plane FA ABD in a position of AF ER/FA IR, which is terminal stance, but not heel off. All this without losing bottom side thoracic abduction, AF IR, and FA ADD/IR to neutral. This is engaging the top side posterior gluteus medius for FA ABD while the top side gluteus maximus is engaged for AF ER, which requires disengagement of the top side adductor and ab wall. And the bottom side IO/TA, medial hamstring, and IC ADDuctor all need to continue to work to ensure that heel strike will start in a position of FA ER, progress toward neutral, and eventually be pulled into FA IR for mid stance.

An inability to perform this stage indicates a possible weakness in top side posterior gluteus medius for FA ABD, top side gluteus maximus weakness in its ability to maintain AF ER, bottom side frontal plane deficiencies, or tight posterior hip capsule in either top or bottom side. Additionally, if there is a posterior mediastinum issue that needs to be addressed on either the top or bottom side, it more than likely will show up at this level, if it hasn't manifested itself already. This corresponds to initiating the process of moving from terminal stance to push off of the top side in its attempt to begin to lateralize in the frontal plane towards the bottom side.

This phase has significant frontal plane gait considerations relative to the thorax, pelvis, and femur. If the thorax is unable to maintain bottom side ABDuction, and if the bottom side pelvic outlet isn't maintained in ABDuction with pelvic floor ascension, the top side femur won't be able to perform FA ABD, the top side pelvic outlet won't ADDuct, and the top side pelvic floor won't descend.

5/5 – Top leg performing AF ER, FA ABD, and FA EXT in the position of FA IR at the same time for terminal stance. This activity requires the use of the top side gluteus maximus for AF ER, inhibition of the top side TFL, inhibition of top side adductor magnus, inhibition of top side IO/TA, and use of the posterior gluteus medius. This also requires continued control of the bottom side IO/TA, medial hamstring, and IC ADDuctor for thoracic abduction and AF IR/FA ADD and FA IR to neutral in preparation for heel strike. It is important that the top leg achieves FA EXT without lumbar extension as over active top side paraspinals will inhibit the top side posterior gluteus medius and gluteus maximus, as well as the bottom side IO/TA.

An inability to perform this stage indicates an inability to perform top side FA EXT without use of top side paraspinals. This indicates that their back is over-active and push off with gait is not a pelvis and hip motion, but a paraspinal/lumbar spine motion, which is dysfunctional. If top side FA EXT is not performed correctly, the indication is that some part of levels 1/5 to 4/5 are not being maintained, which includes facilitation of bottom side IO/TA, bottom side medial hamstring, bottom side IC ADDuctor, top side gluteus max, and inhibition of either side posterior hip capsule, either side posterior mediastinum, top side TFL, top side adductor magnus, or top side IO/TA. This stage corresponds to terminal stance of the top leg and heel strike bottom leg, i.e. terminal double stance.



Hruska ADDuction Lift Test – Tests ability to maintain mid/late stance of bottom leg during introduction of frontal plane demand in the direction of top leg during mid/late swing.

0/5 – Get into a position of bottom leg AF IR and top leg AF ER through bottom side thoracic abduction with the bottom side IO/TA. Inability to raise lower ankle off the table.

An inability to perform this stage indicates an inability to use the bottom side IO/TA, bottom side obturator weakness, an inability to perform a bottom side ZOA, or tight bottom side posterior hip capsule. In addition, the bottom side posterior mediastinum may need to be inhibited. From a Pelvis perspective, top side weakness of sartorius and rectus femoris, or the top side adductor magnus may need to be inhibited.

1/5 – Bottom leg performs full ER in order to get the medial arch of the bottom foot to touch the medial aspect of the top knee. Not related to the gait cycle.

An inability to perform this stage indicates an inability to use bottom side obturator or over activity of the bottom side TFL, which prohibits ER of the bottom leg. More likely is the inability to perform bottom side AF IR and maintain it during FA ER. May need to inhibit the bottom side posterior hip capsule or posterior outlet with the IC Adductor.

2/5 – Full bottom leg FA IR and FA ADD in a position of bottom leg AF IR while maintaining bottom side thoracic abduction. This is mid stance. It is important that the top side IO/TA does not cause the top side ab wall to become short or active. It is important that while the bottom leg is performing FA IR and FA ADD, hip flexion is avoided. If hip flexion is performed, maintenance of AF IR has not occurred. As a result, inhibition of the bottom side psoas will probably need to occur via improved oblique and diaphragm use. The bottom side posterior hip capsule and/or posterior outlet will need to be inhibited as well. If the top pelvis rotates backwards into top side AF IR during this stage, then clearly bottom side AF IR is not maintained, which means they are attempting to get out of bottom side mid stance and into top side mid stance position. The bottom side IC ADDuctor and anterior gluteus medius will need to be the main performers for the bottom leg, and not the bottom side TFL or psoas. If bottom side ligamentous muscle has not been acquired, then this stage will be difficult as well.

It is important that the patient can perceive activity and use of both the bottom side IC Adductor and anterior gluteus medius during this phase of testing. The necessity of the IC Adductor is to not only assist in maintenance of bottom side AF IR, but also to help stabilize a lax inferior hip capsule during FA IR. The necessity of the bottom side anterior gluteus medius is to help stabilize a lax anterior hip capsule during FA IR, and to facilitate the bottom side iliacus in order to help perform inlet adduction.

An inability to perform this stage indicates an inability to use bottom leg anterior gluteus medius and IC ADDuctor in conjunction with the bottom side obliques to perform FA IR in a maintained position of AF IR on the bottom side. The top leg should not be pushing down to achieve success at this stage. This corresponds to mid stance of bottom leg and mid swing top leg.

3/5 – This stage tests the ability to maintain mid stance for the bottom side in a position of AF IR with bottom side IO/TA, IC ADDuctor, and anterior gluteus medius during introduction of top side frontal plane FA ADD in a position of AF ER.



While the bottom side is working hard to prevent transverse plane movement during this frontal plane challenge, the top side ADDuctor magnus is being re-trained for its new job as a femoral stabilizer in relative FA ER in conjunction with the top side gluteus maximus. The top side gluteus maximus and ADDuctor magnus have to work hard in order to stabilize the top pelvis and femur in positions of AF ER and relative FA ER to neutral during this frontal plane shift toward the top leg side. Additionally, the top side adductor magnus will need to work in a feed forward activity to prepare the femur for heel strike by eccentrically opposing the medial hamstring and IC ADDuctor's influence on the femur during heel strike.

Inability to perform this stage indicates an inability to perform bottom side thoracic abduction with IO/TA, AF IR/FA IR with bottom side IC ADDuctor and anterior gluteus medius, tight posterior hip capsule on the bottom side, tight posterior mediastinum on the bottom side, lax pubofemoral ligament of the top side (which may not have been addressed with ligamentous muscle), over active top side TFL, over active bottom side psoas and/or TFL, weak top side gluteus maximus for AF ER, or over active top side abdominal wall (IO/TA).

4/5 and 5/5 – Maintenance of bottom side AF IR with successively more challenging frontal plane shift toward the top side. The question is can they hold onto this newly acquired position of bottom side AF IR/FA IR as long as possible for mid stance despite an increasing demand from the top leg, which is pulling their COG toward the top leg side with a lengthened top side adductor magnus.

As the bottom side IO/TA (for thoracic abduction and AF IR), IC ADDuctor (for FA ADD and AF IR), and anterior gluteus medius (for FA IR) are working harder and harder, the top side is attempting to pull them out of their current position. The top side is in mid to later and later swing phase, but is trying to shift the COG toward the top side in order to prepare for heel strike. Even though the body is shifting toward the top side, the bottom side is more important because it needs to remain stable during active AF adduction and internal rotation at mid stance and not allow the top leg to dictate performance as the top side is still in swing phase.

An inability to progress from stage 3/5 to 5/5 indicates an inability to maintain the bottom side's position of AF IR/FA IR with IO/TA, IC ADDuctor, and anterior gluteus medius; an inability to maintain top side AF ER with the gluteus maximus; an inability to maintain top side neutrality (or relative FA ER) with top leg adductor magnus and EO; a lax top side pubofemoral ligament; tight posterior hip capsule on the bottom side; tight posterior mediastinum on the bottom side; an over active top side TFL; an overactive top side TFL and/or psoas; an overactive top side IO; or a tight anterior hip capsule of the top side.