## IDEAL BREATHING MECHANICS (Anderson J, 2017)

**Exhalation**

- Diaphragm: relaxes and domes upwards
- Ribcage: deflates
- Ribs: internal rotate
- Internal obliques & transverse abdominals: concentrically contract
- Pelvic Floor: concentrically contracts
- Lung Volume: decreased
- Lung Air Pressure: increased
- With full chest deflation, the ribcage, abdominal wall *and* diaphragm are ready to transition to inhalation

- ✓ Ribs lower (down)
- ✓ Ribs IR with assistance from IO/TA's (in)
- ✓ Chest fully deflates (back)

**Inhalation**

- Diaphragm: descends & contracts
- Ribcage: expands
- Ribs: externally rotate
- Internal obliques and transverse abdominals: eccentrically contract to oppose ribcage external rotation and check inflation
- Lung Volume: increases
- Lung Air Pressure: decreases

- ✓ Sternum rises (up)
- ✓ Chest expands (out)
- ✓ Ribs ER (back)

# BELLY BREATHING

**Exhalation**

- Diaphragm: relaxes and domes upwards
- Ribcage: deflates
- Ribs: internal rotate
- Internal obliques & transverse abdominals: concentrically contract
- Pelvic Floor: concentrically contracts
- Lung Volume: decreased
- Lung Air Pressure: increased
- With full chest deflation, the ribcage, abdominal wall *and* diaphragm are ready to transition to inhalation.

✔ Ribs lower (down)
✔ Ribs IR with assistance from IO/TA's (in)
✔ Chest fully deflates (back)

**Inhalation**

- Chest wall does not expand
- Inactive abdominal wall
- The distal borders of the diaphragm expand outward too quickly without abdominal support displacing the belly anteriorly.
- This type of diaphragm flattening is not correct mechanical ventilation.

⊗ Sternum rises (up)
⊗ Chest expands (out)
⊗ Ribs ER (back)

## DISYNCHRONIED BREATHING

**Exhalation**

- Diaphragm doesn't fully dome during exhalation.
- Inactive abdominal wall on exhalation.

⊗ Ribs lower (down)
⊗ Ribs IR with assistance from IO/TA's (in)
⊗ Chest fully deflates (back)

**Inhalation**

- Abdominals tighten to bring in air to a hyperinflated thorax.
- The diaphragm translates forward and becomes agonistic with the back extensors acting as a spinal stabilizer.
- This cycle reduces diaphragmatic mobility and core mobility.
- This type of diaphragm flattening and failure of the diaphragm to relax and dome is not correct mechanical ventilation.

⊗ Sternum rises (up)
⊗ Chest expands (out)
⊗ Ribs ER (back)

## RESETTING DIAPHRAGMATIC BREATHING MECHANICS

**Balloon Breathing**

*(See Page 8)*

Warning: please do not perform if you have latex allergies, recent abdominal surgery, are postpartum, recent cesarean section, have an uncontrolled rectus diastasis, have extreme urinary incontinence issues, pelvic hernias or recent open heart surgery.

For non-balloon qualifiers: try blowing into your fist, a straw (the narrower the more difficult), kazoos, or blowing on a pinwheel. When you get stronger you may graduate to a balloon provided you no longer are dealing with the above conditions.