

## **Extension and Function**

**Mary LaBarre, DPT**

Extension can offer improved outcomes that carry over to daily life. Just because we're born in a fetal position doesn't mean we have to return to it. Extension is vital for maintaining a healthy posture and yet so many of our exercises are focused on flexion. We often focus on flexion for hips, backs, knees, elbows, shoulders, necks, etc. when we might provide clients with better function if we offered more focus on extension.

As we move forward in life, it is common for the head to move forward and the shoulders to round, which can cause chronic back and neck pain.

Inattention to how the head and shoulders are positioned can lead to tight pectoral muscles and weak upper-back and neck muscles, which can result in postural kyphosis, shoulder impingement and neck pain. At the same time, the Achilles tendons and hamstrings become tight. Fortunately, you can help to set straight what has become crooked! By incorporating extension stretch exercises into your clients' sessions, you decrease their risk for debilitating pain.

### ***Here's an example of extension in the water:***

*Begin walking backwards as you inhale for a few counts and exhale for a few. Each time you inhale, lift the crown of your head (your chin should push back and up, you'll feel a stretch on the back of your neck). Relax your head/neck when you exhale. Continue lifting on the inhalation and relaxing on the exhalation.*

*Next, press your shoulder blades down during the inhalation and head lift. Relax everything during the exhalation.*

*Continue for at least 6 reps.*

Also, I like to incorporate Ai Chi into my patient programs to encourage extension. There are a lot of extension movements within Ai Chi to improve shoulder mobility, and strengthen core and shoulder stabilizers to improve posture.

For example *Accepting*: By alternating shoulder horizontal abduction and adduction, thoracic flexion and extension is also created. By emphasizing palm up (shoulder external rotation) during horizontal abduction (arms open wide), one can actively stretch the pectoral muscles to improve spinal extension. If you change to thumb up position with both hands when the arms open wide, you can activate more posterior shoulder and scapular stabilizers which can also help with posture.

### ***Why should we promote extension?***

Thoracic kyphosis and forward spinal flexion are extremely common musculoskeletal imbalances brought on by prolonged time in some postural positions learned through exercise and/or activity choices, environmental factors, myofascial dysfunction, pain, and psychological stress. Kyphotic posture (characterized by extreme convex curvature of the upper spine) can increase the risk of falling (Kado, 2007)

Health issues (minor to major) from forward flexion include:  
musculoskeletal aches and pains: shoulder impingement, low back pain  
breathing problems  
limited function  
impaired athletic performance  
gastrointestinal upsets  
increased mental stress  
vision issue  
decreased organ function  
joint instability  
falls  
inability to move away from midline

### ***Extension in the Water Research***

Walking backward in water, when compared with walking forward in water, resulted in *higher* EMG activation of the paraspinal muscles or erector spinae (61%), the quadriceps (83%), and tibialis anterior (47%). Investigators suspect that the higher activation of the paraspinal muscles is caused by using the arms to assist with locomotion, and greater use of the quadriceps is linked to the higher propulsion force required to move through water, especially when done against a current. Walking backward most likely contributed to the greater use of the tibialis anterior. (Masumoto 2005 and 2007)

Kim, Park and Shim (2010) tested lumbar extensor strength in patients after lumbar discectomy. Subjects were treated with backwards walking, progressive resistance exercise, or no exercise (control). After 12 weeks training, 6 weeks detraining, 6 weeks re-training, it was proven that land exercises and backward water walking both improved lumbar extensor strength compared to control group.

### ***Poor Posture and Its Effect on Breathing***

Di Bari (2004) documented that kyphosis is associated with dyspnea (discomfort or difficulty breathing, shortness of breath) and ventilatory dysfunction (abnormal breathing or oxygenation of the blood), as measured by pulmonary-function test data.

A head that is positioned forward and shoulders that are rounded decrease the space in the chest cavity and restrict lung function. Persons with poor posture may be unable to breathe deeply, resulting in shallow breathing. Continued shallow breathing can cause general fatigue and shortness of breath.

### ***Posture, Gait and Chronic Disease***

Individuals who suffer from chronic disease have an increased risk of developing posture and gait abnormalities. Research has found a strong correlation between severe chronic obstructive pulmonary disease (COPD) and walking abnormalities, concluding that severe COPD causes compromised gait (Yentes et al. 2010). People who have had coronary artery bypass surgery often assume a hunched-over posture to protect the roughly 6-inch-long surgery incision carved into their chests. Similarly, people who suffer from chronic conditions that require prescription medication are at an increased risk of tripping or falling (Lipsitz et al. 1991).

Interestingly, research finds no relationship between flexed posture (of which kyphosis and a forward head are measures) and osteoporosis. Balzini et al. (2003) found that the severity of flexed posture in elderly female patients (without apparent co-morbid conditions) was directly related to the severity of vertebral pain, emotional status, muscular impairments and motor function, but not to osteoporosis.

Parkinson's Disease (PD): Individuals with PD often have kyphotic posture which in combination with other PD symptoms can lead to increased risk of falling. Improving posture and flexibility in all of their joints can improve mobility and balance and decrease the person's risk of falling. Perez-d la Cruz, et al. (2015) looked at Ai Chi and it's benefits to people with PD. After a 10-week program, significant improvement was seen in pain, balance and gait function. The significant benefits discovered also continued 1 month follow up visit after the Ai Chi program concluded.

### **Awareness**

Remind clients that postural awareness is vital in ADLs. All the exercises with proper form won't lead to improved posture if new habits don't replace old, bad ones. Give your clients these reminders—all helpful in promoting healthy cervical posture:

- Always sit and stand tall.
- Press shoulder blades lightly down.
- Point the thumbs up and back to find good shoulder positioning.
- Hold the chin slightly back.
- Check that the ankles are dorsiflexing and plantar flexing during walking, with the heel of one foot striking the floor as the ball of the other pushes off.
- When walking by a mirror, check your posture. Are your shoulders elevated? Is your neck relaxed? Is your core engaged?

### **References**

- Critchley, H., et al. (2002). Fear conditioning in humans: The influence of awareness and autonomic arousal on functional neuroanatomy. *Neuron*, 33, 653-663.
- Georgopoulos, A. (2007). *Movement, Balance, and Coordination—the Dana Guide to Brain Health*. Web citation.
- Hindley, C. (1968). Growing up in five countries: A comparison of data and weaning, elimination training, age of walking and IQ in relation to social class from European longitudinal study. *Developmental Medical Child Neurology*, 10, 715-724.
- Hong. (2002). Positioning for children with learning disabilities. *British Journal of Therapy & Rehab*, 9, 443-446.
- Howe, T., & Oldham, J. (2001). Posture and balance. In M. Trew & T. Everett, (Ed), *Human Movement: An Introductory Text*. London: Churchill Livingstone.
- Hulme, J. (2002). *Bladder and Bowel Issues for Kids: A Handy Guide for Kids Ages 4-12*. Missoula, MT: Phoenix Publishing.
- Hulme, J. (2005). *Solving the Mystery of the Pelvic Rotator Cuff in Human Function and Movement. Back Pain, Balance, Bladder and Bowel Health*. Missoula, MT: Phoenix Publishing.

Kado, DM et.al (2007): Hyperkyphotic Posture and Risk of Injurious Falls in Older Personal: The Rancho Bernardo Study. *Journal of Gerontology*, 62A (6), 652-657.

Kim J-S, et al. Effects of Aquatic Backward Locomotion Exercise and Progressive Resistance Exercise on Lumbar Extension Strength in Patients Who Have Undergone Lumbar Diskectomy. *Arch Phys Med Rehabil*. 2010; 90:208-14.

Labandz, S. (2010). Take a stand for standing. *Exceptional Parent*, (Jul), 47-49.

Martin, C., Provance, P., et al. The effects of static and dynamic standing in multiple sclerosis: Mid-study progress. VA Maryland Health Care. Baltimore. Dept. of Neurology, University of Maryland School of Medicine.

Masumoto K, Takasugi S, Hotta N, Fujishima K, Iwamoto Y. A comparison of muscle activity and heart rate response during backward and forward walking on an underwater treadmill. *Gait Posture*. 2007;25(2):222-8.

Masumoto K, Takasugi S, Hotta N, Fujishima K, Iwamoto Y. Muscle activity and heart rate response during backward walking in water and on dry land. *Eur J Appl Physiol*. 2005;94(1-2):54-61.

Mathias, C. (2002). To stand on ones' own legs. *Clinical Medicine*, 2, 237-245.

Perez-de la Cruz S, Garcia Luengo AV, and Lambeck J. Effects of an Ai Chi fall prevention programme for patients with Parkinson's disease. *Neurologia*. 2016;31(3): 176-182

Uchiyama, I., et al. (2008). Locomotor experience affects self and emotion. *Developmental Psychology* , 44, 1225-1231.

Watanabe, I. (2010). The "other" benefits of proper positioning. *Mobility Management*.

Wechsler, K. (2009). Stand up! MDA's Research and Health Magazine, 18(1).