significant difference (p=0.038) in survival time.[6] However, the actual mean difference between groups was only 10 days, a difference that most patients and clinicians would see as disappointingly small.

On the other hand, you may also read studies in which no statistically significant difference between *groups* is found, but a portion of the intervention group achieved real (> MCD), large, and highly meaningful gains. That means there is some chance that your *individual* patient might also have a very positive outcome. In these cases, it is very helpful to the clinical reader if the author conducts a secondary analysis of 'responders versus non-responders' to distinguish the characteristics of those more or less likely to benefit from the intervention. For example, let's imagine an exercise intervention study in which the primary outcome measure is an increase in physical activity levels including community ambulation. The secondary analysis might show that participants with a high fear-of-falling had no change or very little change, but those with a low fear-of-falling became much more active and independent in community ambulation. You would then be able to measure fear-of-falling in your individual patient to improve your sense of whether or not they would benefit from the new intervention. Even without such a secondary analysis, if the potential benefit of the intervention outweighs the risk of adverse effects and cost of intervention, a clinician might decide to try the intervention despite the lack of statistically significant difference between groups.

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Yoga and Osteoporosis: Making Safe, Effective Recommendations for Patients

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In the United States and Europe, it is estimated that 30% of all postmenopausal women have osteoporosis.[1] Osteoporosis rates are expected to surge worldwide due to the increased number of aging populations.[2] This disease is more common than other disease processes that garner more attention, even though the prevalence of osteoporosis and risk of fracture should be considered a serious public health threat.

Yoga is a popular form of exercise that has been posited to help combat or manage osteoporosis, however, there is a wide perception of what is considered safe within the literature. Lu et al reported that a 12-minute yoga program that included significant spinal twisting (seated spinal twist) and trunk flexion (revolved triangle), and extreme extension (cervical weight-bearing bridging) was not only safe but also improved bone mass density.[3] Interestingly, this study did not offer insight into what statistical tests (ANOVA, t-tests, etc) were performed and did not appear to control for the use of disease modifying agents such as fosamax.[3] On the contrary, Sinaki expressed concern over the use of spinal twists, loaded cervical flexion (extreme bridge and plough), and trunk flexion poses.[4] While there are both obvious risks and benefits to using yoga in the osteoporotic population, the polarity in literature recommendations makes it difficult for health care providers (and hopefully yoga teachers) to know how best to proceed.

Essentially, there are at least two guidelines that offer advice on how a therapist could proceed with recommending yoga postures to individuals with osteoporosis. One is a 2015 modified Delphi consensus statement by Giangregorio et al that offers guidance on exercise recommendations in general for people with osteoporosis with and without fracture. When looking for recommendations specifically related to yoga, health care providers and yoga teachers may also benefit from understanding the 10 Precepts for Safe Yoga Prescription.[5] The first 4 Precepts for Safe Yoga Prescription and Practice,

which were discussed in the previous article on Fall Risk, are congruent with the guidelines from the Giangregorio et al[5] article as well. Let's continue by discussing 3 more biopsychosocially-driven precepts[6] that are pertinent when recommending yoga to individuals with osteoporosis.[7]

Precept 5. Yoga should inform dynamic execution of breath and postures via: (1) internally supported postures *(asana)* or (2) passive rehabilitation methods via externally supported postures *(asana)* based on the value of their functional carryover to ADLs (activities of daily living), like walking or lifting items, for example. Dynamic execution of breath and postures to foster psychobiological safety can be facilitated by two methods, internally supported postures *(asana)* or passive rehabilitation methods via externally supported postures *(asana)*. This means that if a posture cannot be supported internally, through musculoskeletal engagement of trunk or lower quarter stabilizers, for example, then the pose must be supported externally, through methods such as the use of a wall, chairs, yoga props, blankets, or bolsters. An example of this might be using extra blankets to support the head and arms of someone with severe osteoporotic kyphosis when lying supine. Methods are ideally delivered via focus on functional carryover and should follow prioritization as mentioned in the previous precept: stability first, with the spine receiving priority, and mobility second.

Precept 8. Teach non-weight bearing (non-axial loading) headstands (sirsasana) and non-cervical-weight bearing shoulder stands (salamba sarvangasana), emphasizing protection of vulnerable joints that include the small joints of the hands, feet, and the spine and pelvis, especially for osteoporosis populations. The chief impetus for this precept is giving the spine priority in practice. Careful consideration of the epidemic and pandemic of comorbidities that typically plague patients in rehabilitation, therapists and yoga teachers should be advised that axial loading and forced full cervical flexion with (likely) anterior vertebral body shear under loaded conditions is contraindicated. Overall, in individuals at risk for osteopenia or osteoporosis, cervical weight-bearing postures such as plough and headstand should be avoided.

Precept 9. Be non-dogmatic and welcoming to all disciplines of yoga, respecting all spiritual belief systems.

It is valuable to remember that people come to yoga for many different reasons and from many different backgrounds. While some individuals may be interested in learning about the ancient spiritual texts of yoga, such as the Bhagavad Gita or the Upanishads, others may perceive these texts as a threat to their religious and/or spiritual belief systems which can become a barrier to healing. For this reason, medical therapeutic yoga recommends that health care providers nurture non-dogmatic yoga practice within rehabilitation.

For example, if an individual seeks out yoga to heal a physical hurt, it is imperative that the therapist seeks to understand that persons relationship to spirituality through understanding the individual's goals as they pertain to overall well-being. When helping patients navigate their injury from a place of lovingkindness and self-awareness, a therapist can simultaneously empower a patient to engage in meaningful relationships and activities, which in essence is spiritual. This approach is supported by the World Health Organization's International Classification of Disease & Functioning and also by the George Washington Institute for Spirituality and Health that defines spirituality as:

"Spirituality is that part of all human beings that searches for meaning, purpose and connection to others. Spirituality is the way people find coherence and ultimate sense of who they are in relation to the world, to others, and to the significant or sacred."[8]

Working with patients in this manner, requires tremendous self-awareness on the part of the health care provider in order to emphasize inclusion. No matter the entry-point, the care provided through yoga should be person-centered, compassionate, and culturally and gender sensitive. It is our duty (dharma) to guide a patient toward best-evidence mindful practices that are nurturing and sustainable for the self and the universe at large. Unfortunately, the culture of yoga in the United States has knowingly and unknowingly fostered rigidity, abuse, and dogmatic clinging to nonscientific extreme posture performance (extreme and end range of motion movements). This is, ironically, the antithesis of yoga and spirituality.

One of the premises of yoga and any spiritual practice (remember yoga is not a religion) is to cultivate interoception, and for movement-based mind-body medicine, proprioception and neuroception. These 3 ceptions are not exhaustive, but represent perhaps the most critical components with impetus to improve patient outcomes. Defined they are:

- Neuroception is the ability to accurately detect internal risk and external threat.
- Proprioception is the ability to accurately detect where the body is in space.
- Interoception is the ability to understand and know how you are feeling, or success in intrapersonal communication.

For those with or at risk of osteoporosis, yoga cultivates interoception and proprioception, which can affect self-worth, and both interpersonal and intrapersonal well-being, as well as decreased risk of injury due to self-acceptance.[9] Cultivation of healthy neuroception can improve the stress response, which is well supported to improve vagal tone, pain management, and perceived stress while diminishing effects of trauma and chronic disease risk.[10] All of these are variables are posited to affect patient outcomes through addressing common factors in evidence-based biopsychosocial-informed intervention.[11]

PUTTING IT ALL TOGETHER

We can meet the patient where they are while incorporating a safe and effective biopsychosocial framework if these 3 precepts are taken into consideration. However, one question remains. Since there is a paucity of adequately powered, methodologically sound research supporting the use of yoga in people with osteoporosis, how do we as physical therapists make safe recommendations to our patients with osteopenia/osteoporosis who wish to engage in yoga? A 2015 Delphi consensus statement by Giangregorio et al,[5] offers expert guidance on how exercise is best addressed in people with osteoporosis, especially in the presence of fracture history. They recommend that exercise in people with osteoporosis should be focused on 3 specific areas. These areas include addressing fall risk, emphasizing safe patterns

of movement including "spinal sparing," and helping to delay further bone loss.[5] Overall, their recommendations support the use of the above Precepts.

Recommendations on weight-bearing exercise include movements that involve non-twisting, non-forward flexing, and avoidance of extreme extension.[11] Some postures that could be done are[5,6]:

- Shoulder lock in supine - arm spirals: For endurance, we have people use internal support within the pose in order to develop spinal extensors, which is emphasized over strengthening alone. This means shoulder lock and TATD are vital parts of this posture performance. When shoulder lock is unable to be maintained, the patient should rest. **Watch and practice the arm spiral here.**
- Chair: emphasis on shoulder lock/ arm spiral
- Warrior I: emphasis on shoulder lock/ arm spiral
- Tree: emphasis on shoulder lock

Recommendations on poses to avoid include the following[5]:

Forward folds, seated twists, and seated standing twists with flexion (supported by Delphi consensus).[5]

Finally, there is the importance of continued use of motivational interviewing in order to promote salience, and identification of barriers that affect self-efficacy, adherence, and patient safety. Some of those barriers could include lack of social support, lack of access to physical therapy services, lack of transportation, or poor health literacy. It is additionally important when working with person's with osteoporosis that therapists seek to understand the individual's beliefs about exercise. For example, does the patient believe exercise will help or does she think she will get hurt? On the opposite end of the spectrum, some individuals may believe that if they are not engaging in intense high impact activities that they are not exercising. In order to promote adherence, self-efficacy, and patient safety within this high fracture risk population, promoting self-awareness of beliefs about exercise and physical activity as well as neuroception, proprioception, and interoception is paramount.

Regardless of the type of movement or postures you ultimately prescribe for your patient, there are some universal recommendations that fit almost all populations. These include properly

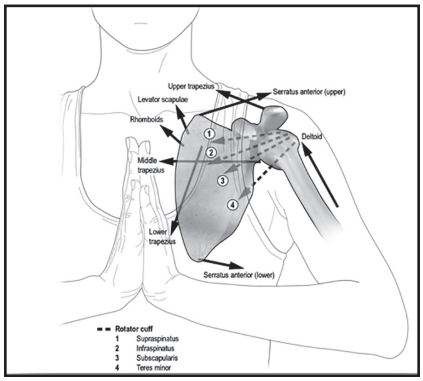

Figure 1. Shoulder locking.

Figure 2. Arm spiral.

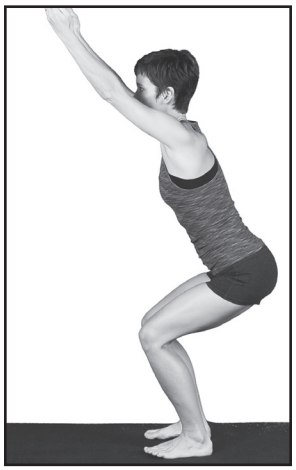

Figure 3. Chair.

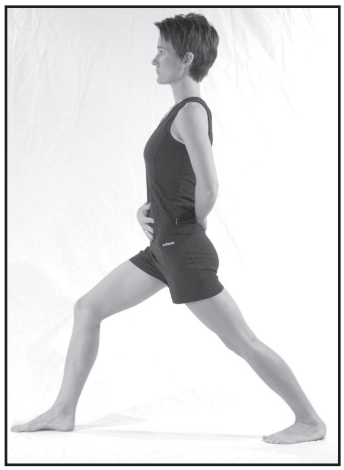

Figure 4. Warrior 1 Mod 2.

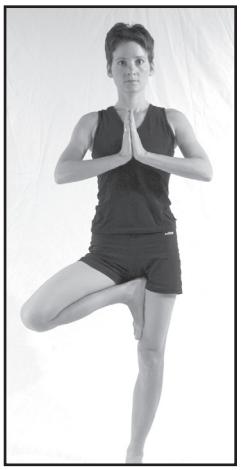

Figure 5. Tree.

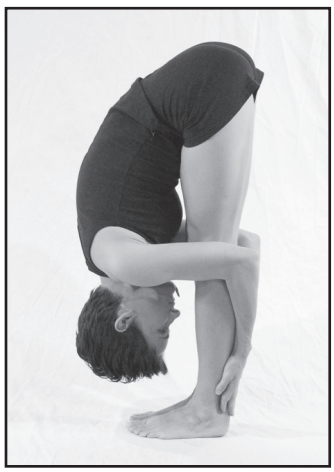

Figure 6. Forward standing bend full.

Figure 7. Seated twisted.

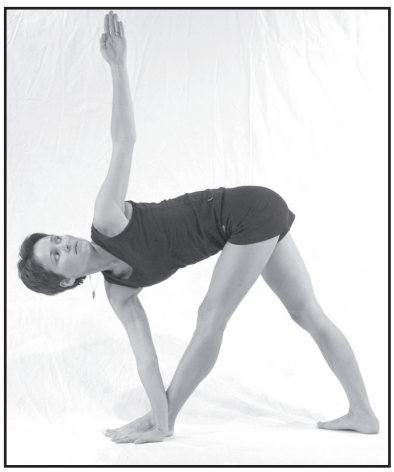

Figure 8. Revolved triangle.

pressurizing the system by teaching the patient to recognize the 3 critical diaphragms that support the trunk and assist in spine sparing. These diaphragms must act synergistically to support the spine, and include the cervico-thoracic or laryngeal diaphragm, the respiratory diaphragm, and the pelvic diaphragm. Together with transversus-assisted thoraco-diaphragmatic breath, known as TATD breath, functional positions during weight-training can be well supported and coordinated with the breathing.[6] Learn about and practice **TATD breath here.**

Join us for the next article in this series on yoga for pelvic health.

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Enhancing Rehabilitation Services in Developing Countries

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Many years ago, in the middle of a presentation that I was giving to physical therapists in San Salvador, El Salvador, one of the participants made an odd face at me while I discussed how to use a blood pressure cuff to assess orthostatic hypotension during a balance evaluation. I stopped speaking and asked what was wrong. She said that they did not have equipment like a blood pressure cuff in her center. How was she supposed to do this test? Other therapists in the class agreed. It was a sobering moment. They said that in large hospitals there would often only be one pulse oximeter and a physician had it. If the therapist needed to check oxygen saturation, he had to page the physician to come perform the assessment. It was an eye opening experience for me. When planning the course, I had purposely tried to only include interventions that did not require expensive, difficult to obtain equipment. However, my perception of an inexpensive relatively common piece of equipment was very different from their reality.

Health care professionals in general, and rehabilitation professionals in particular, face many challenges in developing countries. The World Health Organization (WHO) met to discuss rehabilitation in the developing world in 2017. The report "Rehabilitation 2030: A Call to Action" ensued.[1] This report discusses unmet rehabilitation needs around the world, the growing demand for rehabilitation services, and the need for better access to rehabilitation services. The report also outlines current barriers to strengthening and extending rehabilitation services. These barriers include:

- Under prioritization by government among competing priorities