Vestibular Balance Disorders (including Vertigo) and Yoga

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Thesis

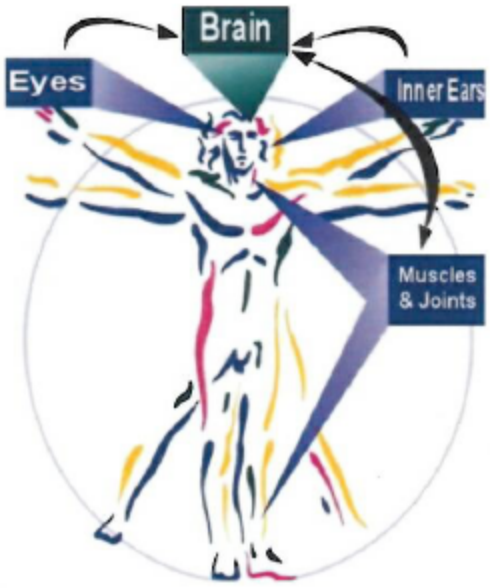
For most of us, moving around our world is done without thought. We move without having to consciously work at it. We run our errands, walk the dog, get up from the dinner table or sit in our favorite chair to read the Sunday paper without thinking. Our body follows our every command without complaint and always with accuracy.

Now, what if your world suddenly became like jell-o? You feel as if everything is all tilted and jiggly. You wobble when you walk and you feel like you are going to fall. You find you stumble getting out of bed in the middle of the night. When you step from the cement sidewalk to grass your world starts to tilt and you become dizzy. These are symptoms of impaired balance. And those that are challenged by these symptoms are not alone. Roughly 40 percent of the population suffers from impaired balance at some time during their lives.[1]

The human balance system is a complex system that gives you the ability to control and maintain your body's position when you are moving or when you are still. It helps you to identify direction and speed of movement. It allows you to automatically adjust to maintain posture for stability when you perform various activities. In other words, our sense of balance is a whole body experience. It is also a learned experience. It takes a baby about two years to have a relatively stable balance on two legs and another year to be able to stand on one leg.[2] In fact, our sense of balance continues to perfect itself as we grow and our bodies strengthen and mature.

Balance is controlled by the sensory input from sight, touch, the inner ear (also called the vestibular system), and the muscles and joints. Maintaining your balance depends on the information these sensory sources send to your brain. When the information sent to the brain by any of these sources is disrupted, a conflict within the brain occurs causing you to feel disoriented, unsteady or dizzy. You may feel as if you are spinning or floating even though you are standing still or lying down.[3]

[11] *Dizzy* by Jack J. Wazen, M>D. with Deborah Mitchell
[2] *Dizzy* by Jack J. Wazen, M>D. with Deborah Mitchell
[3] National Institute on Deafness and Other Communication Disorders – Fact Sheet on Balance Disorders



The Senory Inputs in the Human Body

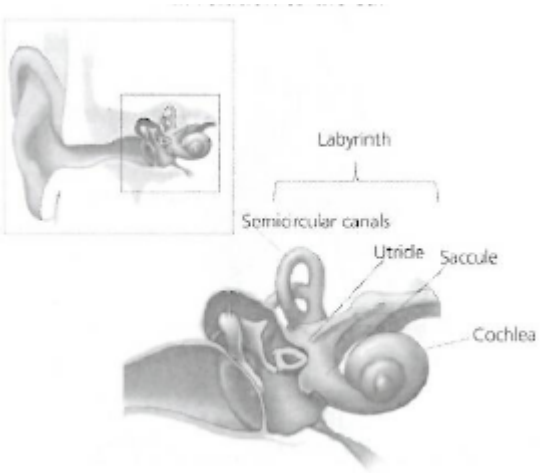
This paper focuses on the vestibular system. How it can affect a person's balance and what yoga can do to help those who suffer with balance disorders caused by disruptions to this system.

Vestibular System – The Science

The medical term for the parts of the inner ear involved in balance is called the vestibular system. This sensory source to the brain provides information about motion, equilibrium, and spatial orientation. For example, our sight sends a signal to the brain about the body's position in relation to our surroundings. Input from the muscles, joints, and vestibular system alert you as to where you are within the room. Think of the spinning games you played as a child and how you adjusted after the spinning stopped.

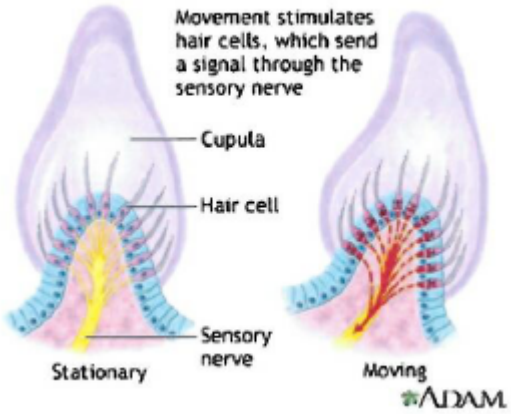
Our balance is primarily controlled by a structure in the inner ear called a labyrinth. (See figures below.) At one end of the labyrinth is an intricate system of loops and pouches called semicircular canals and the otolithic organs. At the other end of the labyrinth is a snail-shaped organ called the cochlea which enables us to hear.[4]

[4] National Institute on Deafness and Other Communication Disorders – Fact Sheet on Balance Disorders



The semicircular loops or canals inform our brain when our head moves up or down or when we look from right to left. Within each semicircular canal is a gel-like structure called the cupula which sits on top of a cluster of hair cells. The hair cells have long threadlike extensions, called stereocila that extend upward into the gel. When your head moves, the fluid inside the semicircular canal moves causing the cupula to move which causes the stereocila to tilt to one side. This action sends a signal to your brain about the movement and position of your head.[5]

The otolithic organs lie between the semicircular canals and the cochlea. These are fluid filled pouches, called the ultricle and saccule, which tell the brain when our body is moving in a straight line and the position of our head versus gravity (i.e. whether we are sitting up, leaning back or lying down). The ultricle and saccule are topped by tiny grains also called "rocks". When your head moves, gravity pulls on these grains which, in turn, move the stereocila and a signal is sent to your brain about the position of your head.



Normal balance requires your muscle strength to be in tune with your vision, touch, and inner ear (vestibular system). Balance information sent to the brain by all the senses and

[5] National Institute on Deafness and Other Communication Disorders – Fact Sheet on Balance Disorders

the muscles and joints is sorted out and integrated with learned information contributed by the coordination center of the brain and with the thinking and memory center of the brain. When one of these senses isn't functioning well, you can experience the symptoms of imbalance. When the vestibular organs on both sides of the head are functioning properly, they send symmetrical impulses to the brain. When they aren't working properly, the brain receives mixed signals. When this happens, a person can become disoriented due to this conflict in the information received by the brain. Take, for example, when a person is standing next to a bus that is pulling away from the curb. The image of the rolling bus creates an illusion for the pedestrian that she, rather than the bus, is moving while the information received from the muscles is that the body is standing still. A real feeling of disorientation and dizziness then occurs.[6]

Most balance problems are directly related to issues with the vestibular system.[7]

Vestibular Disorders

Balance problems can be caused by any one of the following:[8]

- Displacement of the otoliths (see Vestibular System – The Science)
- Viruses or upper respiratory infections
- Blows to the head
- Ear infections
- Long term use of certain antibiotics
- Allergic reactions
- Migraines
- Reduced blood flow to the brain
- Changes in intracranial or atmospheric pressure
- Aging

There are more than a dozen different balance disorders. The most common Vestibular Disorders are:[9]

- Benign Paroxysmal Positional Vertigo (BPPV)

  BPPV is a brief sensation of vertigo that occurs because of a positional change of the head. BPPV can occur when rolling over in bed or looking up at an object on a high shelf or turning your head to look over your shoulder (as in the act of backing up your car). This disorder is the most common all the balance disorders. Approximately 25 percent of people with a vestibular disorder are diagnosed with

[6] Vestibular Disorders Association http://www.Vesibular.org
[7] Deaconess Physical Medicine brochure on Balance and Physical Therapy
[8] Deaconess Physical Medicine brochure on Balance and Physical Therapy
[9] National Institute on Deafness and Other Communication Disorders

BPPV.[10] Eighty percent of those diagnosed with BPPV can undergo a series of quick, painless procedures in one treatment and be free of the disorder.[11] (see Diagnosis)

- Labyrinthitis

  Labyrinthitis is an infection of the inner ear which causes dizziness and loss of balance. This can be an after affect of an upper respiratory infection such as the flu.

- Meniere's disease

  An inner ear fluid imbalance disorder that causes episodes of vertigo, fluctuating hearing loss, and a ringing or roaring in the ears. Roughly, 2.5 million people suffer from this vestibular disorder which usually appears between the ages of 30 to 50.[12]

- Vestibular neuronitis

  Inflammation of the vestibular nerve generally caused by a virus which causes vertigo.

- Perilymph fistula

  A leakage of the inner ear fluid into the middle ear. This can occur after a head injury or physical exertion.

Symptoms

When balance is impaired an individual has trouble maintaining orientation. Vestibular balance problems cover a wide range of symptoms. Some of the symptoms a person may experience are:

- Sensation of dizziness or vertigo. (This is the most common symptom.)
- Unsteadiness when walking
- Nausea
- Feeling of falling
- Lightheadedness or a woozy feeling
- Blurring vision
- Disorientation
- Muscle aches in the neck or back

The above symptoms may be mild or severe. They can appear and disappear over several minutes, an hour or two, or over longer periods of time. Symptoms can become worse in dim lighting. For others, bright light triggers the feelings. Unfamiliar surroundings,

[10] *Dizzy* by Jack J. Wazen, M.D with Deborah Mitchell
[11] *Dizzy* by Jack J. Wazen, M.D with Deborah Mitchell
[12] *Dizzy* by Jack J. Wazen, M.D with Deborah Mitchell

navigating uneven surfaces, feeling fatigue, excess or loud noises, or certain smells can bring on symptoms. In addition, a person with vestibular balance impairment may feel changes in heart rate and blood pressure.

Day to day living with imbalance can also create reactions such as fatigue, depression, stress and trouble with concentration. A person's memory and thought processes can be impaired. A person can become irritable, depressed, anxious or panicky. Many with vestibular balance disorder show a loss of self-esteem.

Having vestibular balance impairment can severely limit the activities and lifestyle for those who suffer it. For example, being in unfamiliar, crowded and often noisy places such as restaurants is a challenge. The Lifestyle Physical Therapy and Balance Center in Chicago, has the following suggestions for dining out for those with imbalance disorder:[13]

- Pick a restaurant with small separate rooms.
- No matter where you go, avoid rush hours.
- Seek carpeted floors that reduce conversational noise and vibrations caused by waiters moving nearby.
- Avoid visually distracting shiny, checkered floors and surfaces, as well as ceiling fans and busy wallpaper.
- If the restaurant has a Web site, download a menu in advance and plan the meal to avoid visual strain and confusion.
- Seat yourself in the corner of a restaurant, avoiding the bustling middle.
- Sit away from kitchens, cash registers, and bars.
- Sit in chairs rather than benches to reduce motion caused by others seated next to you.
- To reduce the amount of head turning required to converse, choose a round table or sit at the head.
- Fluorescent lights may cause visual difficulty; sit away from and with your back to the light.
- Be aware that many restaurants control lights with a central rheostat, which can be visually disorienting when the lights are adjusted.
- Extinguish flickering candles on the table or ask for the wick to be trimmed.

The above suggestions are a very long and daunting list of things to avoid. It is easy to understand why people with balance disorders need to prepare and think about any

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[13] Lifestyle Physical Therapy and Balance Center website: http://www.vestibular.org/support-groups/challenges.php#TravelReduced

activity they do. And it is easy to understand why many just avoid doing anything as the challenges are many and may just seem too difficult to overcome.

DIAGNOSIS

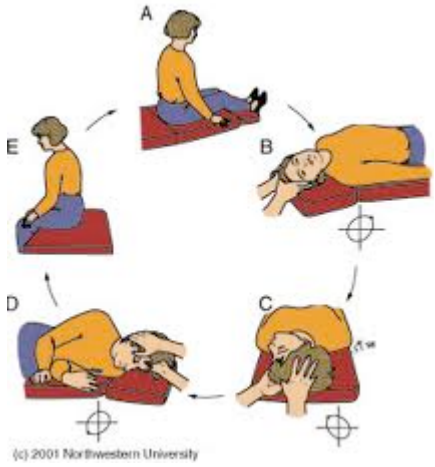
A person having dizzy symptoms is diagnosed by their primary physician through a variety of tests: hearing exam, vision exam, tests to evaluate balance and gait, C.T. or M.R.I. scans of the head. Once a diagnosis of a balance disorder has been made, the physician refers the patient to a physical therapist. The physical therapist (preferably one specializing in balance disorders) will work with the patient to retrain the brain to work with their environment and the symptoms they have.

I interviewed Dr. Michele Kehrer, PT, DPT, ATC of LifeStyle Physical Therapy & Balance Center for this paper. Dr. Kehrer is a physical therapist who specializes in balance disorders.

According to Dr. Kehrer, the physical therapist will perform a number of tests of their own to evaluate the patient and devise a treatment plan. The most common diagnosis, BPPV, is treatable. Usually, one session with the physical therapist along with several follow-up retraining sessions is very effective in relieving the patient's symptoms. In the case of BPPV, the physical therapist will first perform the Epley and Semont maneuvers for vertigo before retraining therapy. In these maneuvers the head is firmly moved into different positions to move the fluid through the inner ears and reset the "rocks" in the inner ear.

Semont maneuver

Epley maneuver



After the maneuvers are completed, the physical therapist will put the patient through a series of exercises to retrain or re-condition the brain to compensate or ignore false signals sent from the inner ear that detect motion. These exercises focus on positional movements of eyes, head, hands and feet with posture and balance movements to help retrain the body's balance system. Light therapy will be used to train the brain to focus and eliminate outside stimulae. For example, Dr. Kehrer has a "light" room. The patient is placed inside a room, all lights are turned off and a small, bright red pin-point light is reflected on one wall. Another switch is thrown which projects small circles of light swirling all over the room, floor to ceiling. In the meantime, the red pin-point light is slowly moving to the right, the left, then up and down. The patient is to keep their focus on the red light and ignore the swirling circles. Think Star Wars. That's how I felt when I was placed in the room. Dr. Kehrer said it is not unusual for patients to become nauseated the first few times performing this exercise.

In the case of someone whose diagnosis is not BPPV, Dr. Kehrer plans treatment that includes retraining exercises and light therapy similar to that for BPPV patients minus the Semont/Epley maneuvers.

YOGA CAN HELP

The goal of physical therapy for one who is suffering from a vestibular disorder is to reduce or eliminate symptoms. Therapy to improve the patient's equilibrium, mobility, and overall strength, flexibility and range of motion is included. Dr. Kehrer was very enthusiastic about adding yoga to a patient's therapy routine. She believes that one of the best ways for a patient to heal is performing the therapy exercises she gives them in conjunction with yoga. For some patients, the brain takes longer than anticipated to learn to compensate for impaired balance. It can be months before re-conditioning takes hold. In the intervening time, yoga can be an additional component to a patient's overall treatment. The positional movements of the asanas help reinforce the physical therapy balance and coordination exercises.

Patients with balance disorders also develop secondary symptoms such as decreased strength, loss of range of motion, increased tension – particularly in the cervical spine and shoulders, muscle fatigue and headaches. Yoga is well known for increasing the strength and flexibility for those who practice. In addition, the added benefit of stress relief that yoga offers helps anyone with a balance disorder as they are likely to be anxious and more fearful. It is well documented that yoga reduces stress, depression, and anxiety. Yoga also helps to retrain the brain because it requires a person to move their body and head together and also in opposition to each other. This positional movement is crucial for a patient's retraining to take place.

Vestibular physical therapy has the following important components:[14]

- strengthening, balance and postural exercises
- proprioception tasks (e.g. movements that challenge your sensory input)
- sensory integration tasks (i.e. movements that improve the ability to interpret sensory input – where your arm or leg is in space).

It sounds a lot like a yoga class. Certainly the one I attend every week. And the components are those I try to integrate into my home practice. However, I wouldn't call Virabhadrasana III a sensory integration task. And I wouldn't call Parivrtta Trikonasana a proprioception task. But they both are.

According to Dr. Timothy McCall, one of the 50 health conditions benefited by yoga is balance problems.[15]Recent science findings have shown that alternate nostril breathing is effective for those who suffer balance disorders. This pranayama practice produces optimum function to both sides of the brain which leads to a balance between a person's creative and logical thinking.[16] The practice calms the mind and the nervous system which leads to reduced stress and anxiety. And the rhythmic flow of switching between

[14] *Dizzy* by Jack J. Wazen, M.D with Deborah Mitchell
[15] Dr.McCall.com
[16] National Center for Biotechnology Information (www.ncbi.nlm.nih.gov)

nostrils not only brings more oxygen into the body, but also helps to calm the nervous system by creating a focus away from symptoms.

YOUR CLASS

A student coming into your class for the first time suffering from a vestibular disorder will most likely tell you, the teacher, about the problem. However, you may have a student who doesn't wish to publicize their diagnosis. So, how would you recognize a vestibular disorder in one of your students?

Look for the following as you study your class:

- When in Adho Mukka Svansana, the student doesn't drop their head. They look up while doing the pose. Someone with vestibular disorder doesn't like to put their head upside down.
- When standing in Tadasana, the student will start to sway. They may even perform some poses with their eyes closed. Seeing the movement of the hand or foot can cause vertigo for some.
- They will move much slower than the rest of the class when flowing from Uttanasana to Tadasana to prevent dizziness. And they may look up in Uttanasana and not put their head in a completely down position. The head upside down syndrome again.
- The motor skills will be slower than those of other students in the class. Those with balance difficulties need to plan their movements and need to know where their hands and feet are in relation to their body.
- The student will have much more trouble setting up in standing poses especially if moving from Anjaneyasana to Virahabdrasana I or II. They also will make the stance of Vira I or Parsvottanasana much wider than normal in order to create more stability while in the pose.
- The student will be lost if you ask the class to perform a series of poses quickly or a vinyasa sequence at a fast pace. Setting up the pose and then maintaining the position is optimal for those with balance issues.
- When the student has become familiar with the asanas in your class and feels comfortable with them, you may find that introducing a new pose or vinyasa sequence causes anxiety. They either won't do it or are very uncomfortable. They become fearful when trying new things unfamiliar to them because it might make them dizzy.
- Encourage the use of props, particularly the use of yoga blocks.
- Have the student stand in the very front row of the class. Performing poses when they can view the other students at the same time can cause dizziness.

Should you avoid any poses if you know you have a student with vestibular disorder? I asked Dr. Kehrer this question when I interviewed her. In all of my research for this paper, it was stated time and again that headstand, handstand, and shoulder stand should be avoided. Dr. Kehrer disagreed with my findings. She feels that patients have no need to avoid any asana pose. That they can and should fully participate in whatever poses the teacher is instructing the class to do.

I also interviewed a fellow yogi, Mary, for this paper. Mary has had a vestibular balance disorder (Meniere's) since 1999 and has been practicing yoga for 11 years. Mary agreed with Dr. Kehrer and not with my research findings. She also felt that someone with a balance disorder can and should perform all poses the teacher presents in class. Therefore, if your student feels comfortable with doing shoulder stand suggest the supported variety of the pose using a chair. And work with the student to set up and position into the pose.

WHAT TO DO IF DIZZINESS OVERCOMES THE STUDENT

There are several things you can do if a student presents with dizziness during class that is too great for them to ignore. Let the student judge what they think will feel most comfortable and stable for them.

- For stability, have them stay in Tadasana. Place a bean bag (or any kind of weight – bag of rice for example) on top of their head. The weight gives a sense of stability and calms the student.
- Have them focus on their breathing to reduce any anxiety and to focus their attention away from their dizziness.
- Offer to turn the lights down or off, if possible. Low, diffuse lighting is preferable for those with vestibular balance disorder.
- Turn down any music you may be playing or choose music that does not have a bass line that reverberates (or thumps). The vibrations of a prominent bass line thumping in the background can cause vertigo.
- Place them in fully supported (restorative) setu bandha sarvangasana. Additionally, a bean bag can be placed on the student's head. Bridge pose is highly recommended for those with vestibular balance disorders as it is calming and stable.
- Have the student sit on the edge of a chair placing forearms on thighs, clasping the hands together with the face down. Have the student place one thumb on top of the other. Then ask them to focus their gaze on the thumbnail. Have the student sit for 3 – 5 minutes in this position. This calms the vestibular system.

Yoga Sequence for Positional Movement, Alignment and Strength

1. Supine Tadasana

   First part of sequence are eye/limb positional movements to be performed supine on your back with long, slow inhale/exhale.

2. Lumbar Arch.

   Inhale lift belly and slightly arch lower lumbar, exhale and flatten belly towards floor, navel to spine. This is a small movement. 4x

3. Same movements as Step 2 above, but raise arms straight overhead when arching lumbar and lower arms as belly flattens. 4x

4. Same movement as Step 3 above, but chin moves up as arms raise and back arches on inhale and on exhale chin moves to sternum as arms are lowered. 4x

5. Same movements as Step 4, but exaggerate the chin movements so when chin is lifted the eyes look back and overhead in the inhale. 4x

6. Sit up.

   This is a modified sit up. Bend knees and clasp hands behind head. Inhale. On exhale, lift shoulders off the ground as you move navel to spine. Inhale to down position. 4x

7. Same movements as Step 6 but on exhale exaggerate chin movement to sternum as you lift shoulders off the ground and on inhale lift chin up. 4x

8. Spinal Twist.

   Knees bent with legs together, arms straight out at sides, shoulder width apart. On inhale lower legs to right and externally rotate left arm while internally rotating right. Exhale legs back to center and arms to starting position. The arm movement is like a flipper movement back and forth. Repeat on left side. 4x

9. Repeat Step 8 and move head in same direction as legs. 4x

10. Repeat Step 9 with head moving in opposite direction from legs. 4x times on each side

11. Stretch legs out and lift arms overhead and rest hands on elbows. Move arms slowly to left and then to right. 4x

12. Repeat Step 11. Move head in same direction as arms. 4x

13. Repeat Step 11. Move head in opposite direction as arms. 4x

14. With arms still lifted overhead, elbows clasped, move arms in a complete circle over head keeping eyes on the wrist or forearm during the whole of the movement.

15. Bring knees to chest, roll to right side up to table.

16. Cat/cow 6x

Standing Poses for Stability and Strength

17. Uttanasana vinyasa: urdhva hastasana to uttanasana to ardha uttansana to uttanasana to urdhva hastasana 3x
18. To Uttanasana. Step left leg back, bend right knee and come into anjaneyasana. Stay in position getting balance and then raise left arm, stretch arm overhead to the right for lateral stretch as you move head and look to left. Move arm and body back to center and stretch to right once more.
19. Still in anjaneyasana, with left arm lifted, move into revolved prayer twist to the right.
20. To adho mukka svanasana and lift left leg and place it between hands, bend left knee into anjaneyasana. Stay in position getting balance and then raise right arm, stretch arm overhead to left for lateral stretch as you move head and look right. Move arm and body back to center and stretch to left once more.
21. Still in anjaneyasana, with right arm lifted, move into revolved prayer twist to the left.
22. Bring right foot up to meet left and step into uttanasana.
23. Slowly uncurl spine to Tadasana.
24. Trikonasana on right side and then repeat on left.
25. Vira II on right - hold the position, eyes gazing out over out stretched hand.
26. While still in Vira II straighten bent knee and move head back to center. Move back into the pose once again with eyes gazing over hand. Repeat 2x.
27. Repeat Vira II on left side – hold the position, eyes gazing out over out stretched hand.
28. While still in Vira II on left straighten bent knee and move head back to center. Move back into the pose once again with eyes gazing over hand. Repeat 2x
29. Parsvakonasana on both sides
30. Vrksasana on both sides using wall for support.
31. To table to Dandasana
32. Setu Bandha Sarvangasana, supported with block
33. Maricyansana 3 twist to both sides
34. Sukhasana with alternate nostril breathing (exhale longer than inhale) 8 rounds
35. Viparita Karani (as savasana)
36. Meditation

Yoga Sequence for Stress and Relaxation

1. Supine on bolster with belly breathing. Roll out to right side up to Sukhasana.
2. Sukhasana - countinuing belly breathing for several more minutes
3. Raise right arm. Lateral stretch to the left as you look to the right. Repeat other side.
4. Parsvasukhasana (cross-legged twist on both sides).
5. Adho Mukka Virasana resting head on blanket.
6. Tadasana
7. Uttanasana vinyasa: urdhva hastasana to uttanasana to ardha uttansana to uttanasana to urdhva hastasana 3x
8. Tadasana
9. Standing Balance

   With arms out at shoulder height, shift weight to right foot as you lift the left foot off the floor. Hold position for 3 breaths. Repeat with the left foot. Complete both sides 6x
10. Tadasana with yoga mudra behind back
11. Diagonal Standing Balance

    Feet hip distance apart. Bring fingertips together over front of hips/look to right/inhale and move right arm up at a diagonal to the body as you extend and point the left foot out. The left arm moves downward so the arms are in a diagonal line. Hold position for 3 breaths. Repeat other side. Complete both sides 6x.
12. Tadasana
13. Vira I on the right. Hold the position for 5 breaths. Then straighten knee as the head moves to look to the right, arms remain in position. Bend knee to move into full position again. Straighten knee and move head to look left. Bend knee to move into full position again.
14. Tadasana.
15. Repeat Vira I on the left following the instructions in Step 12.
16. Tadasana
17. Parsvottanasana on right with blocks for support. Repeat on other side.
18. Adho Mukka Svanasana to table.
19. To Salabasana. 3 variations. Lift only legs for first variation/lift only arms for second variation/full pose lifting both arms and legs for third variation.
20. Adho Mukka Svanasana to seated
21. Janu Sirsasana

22. Restorative Pachimottanasana using bolster for body and head support
23. Restorative child's pose with bolster
24. Restorative setu bandha sarvangasana
25. Maricyanasana 3 twist to both sides
26. Supine with So Ham pranayama
27. Savasana
28. Meditation

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