

Appendix 1: Yoga Exercise

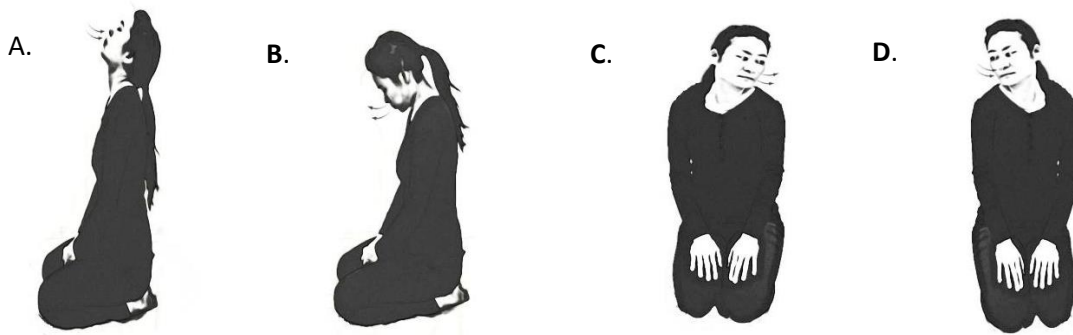
(All the images were produced by Priya T Ravindranath)

Yoga techniques were developed from the teachings (written and oral) of Asana Andiappan (Andiappan, 2004) BKS Iyengar (Iyengar B. K., 2006 (first published in 1966); Iyengar B. , 2007) and other yoga texts (Muktibodhananda, 2006) (Bhutada, 1994).

Sitli karna vyana - Warm up exercises

The first step is performed in a comfortable sitting position (Figure 1) and the steps 2-5 (Figure 2-5) are performed in a basic standing posture, with legs one foot apart. The 6th step (Figure 6) is performed in prone position, lying on the chest, with the face down and palms on the floor, beside the waist.

Step 1



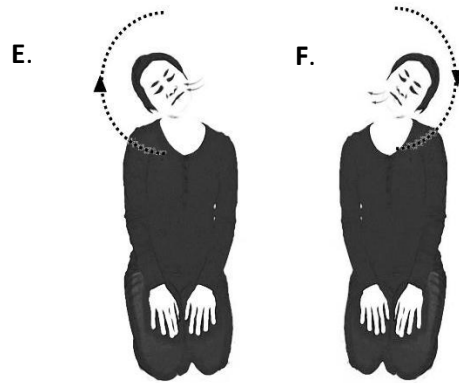


Figure 1: Illustration of step 1 in warm up exercises. A-F, depict head movements during neck rotation. A. Neck extension on inhalation. B. Neck flexion on exhalation. C. Left side twist of the neck on exhalation. D. Right side twist of the neck on inhalation. E and F denote neck rotation, which is synchronised with an inhalation in the first half of rotation and exhalation during the second half of the neck rotation cycle.

Step 2

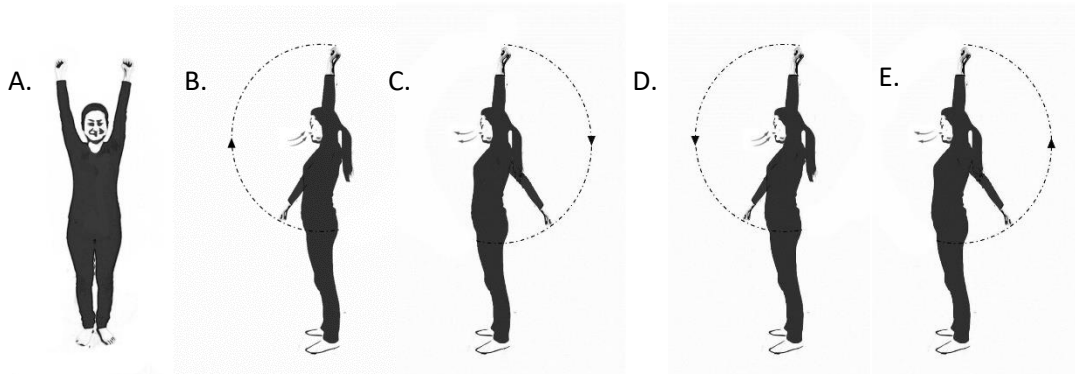


Figure 2: Illustration of step 1 in warm up exercises. A,B,C,D and E depict shoulder movements during shoulder rotation. B and C denotes shoulder rotation in clockwise direction. D and E denotes shoulder rotation in anti-clockwise direction. Rotation is synchronized with inhalation in the first half of rotation and exhalation during the second half of the shoulder rotation cycle.

Step 3

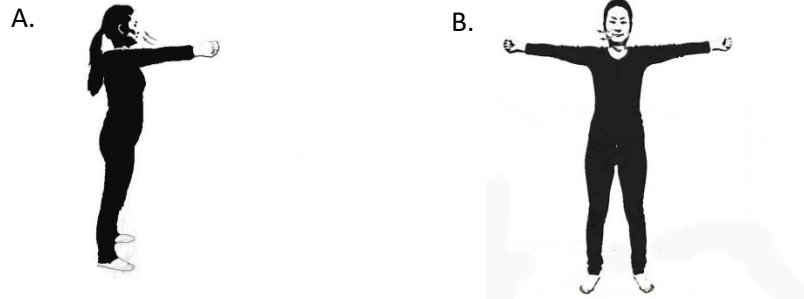


Figure 3: Illustration of step 2 in warm up exercises. Arms are raised to the shoulder level and hands are alternately brought together and spaced far apart, along the same plane. A. Exhalation on hands together. B. Inhalation on moving the hands far apart.

Step 4

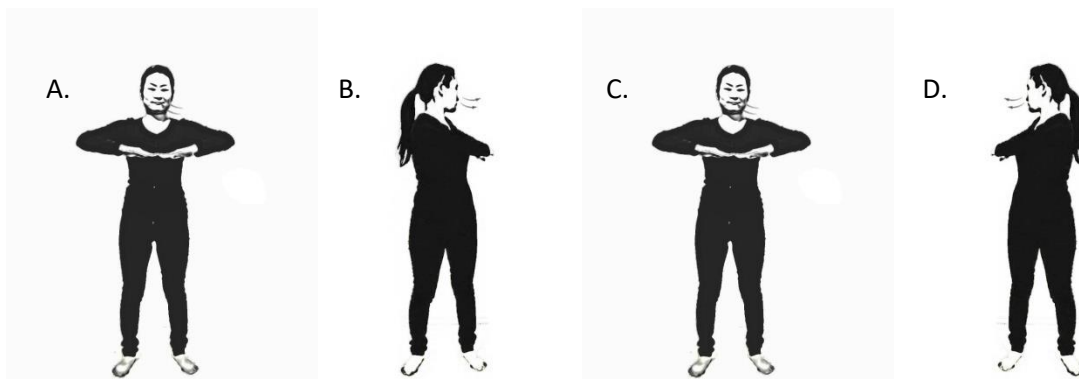


Figure 4: Illustration of step 3 in warm up exercises. A. Arms are raised to the shoulder level and elbows are bent, with both hands lying close to each other, on inhalation. B. Upper torso is twisted to left side on exhalation. C. Reversal of the previous left twist on inhalation. D. Upper torso is twisted to right side on exhalation.

Step 5

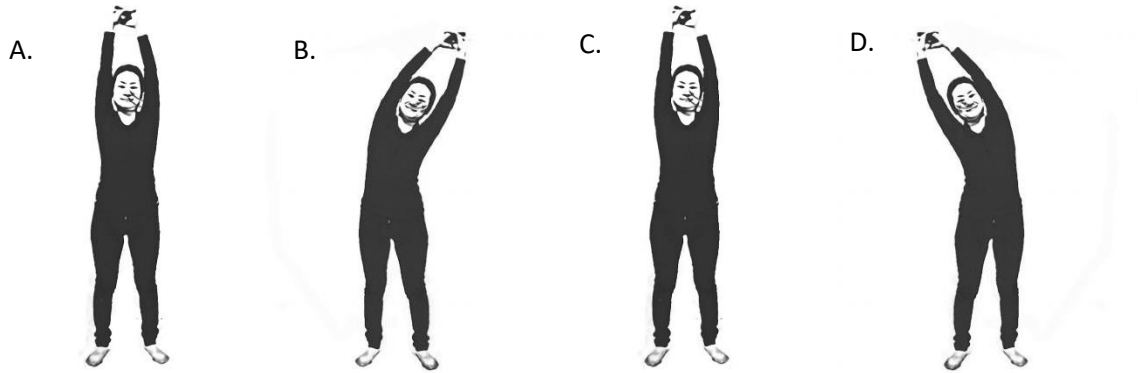


Figure 5: Illustration of step 4 in warm up exercises. A. Hands are raised above the head with arms touching the ear on inhalation. B. Body is bent to left side on exhalation. C. Reversal of the previous left side bent on inhalation. D. Body is bent to right side on exhalation.

Step 6: *Urdhva mukha svanasana*

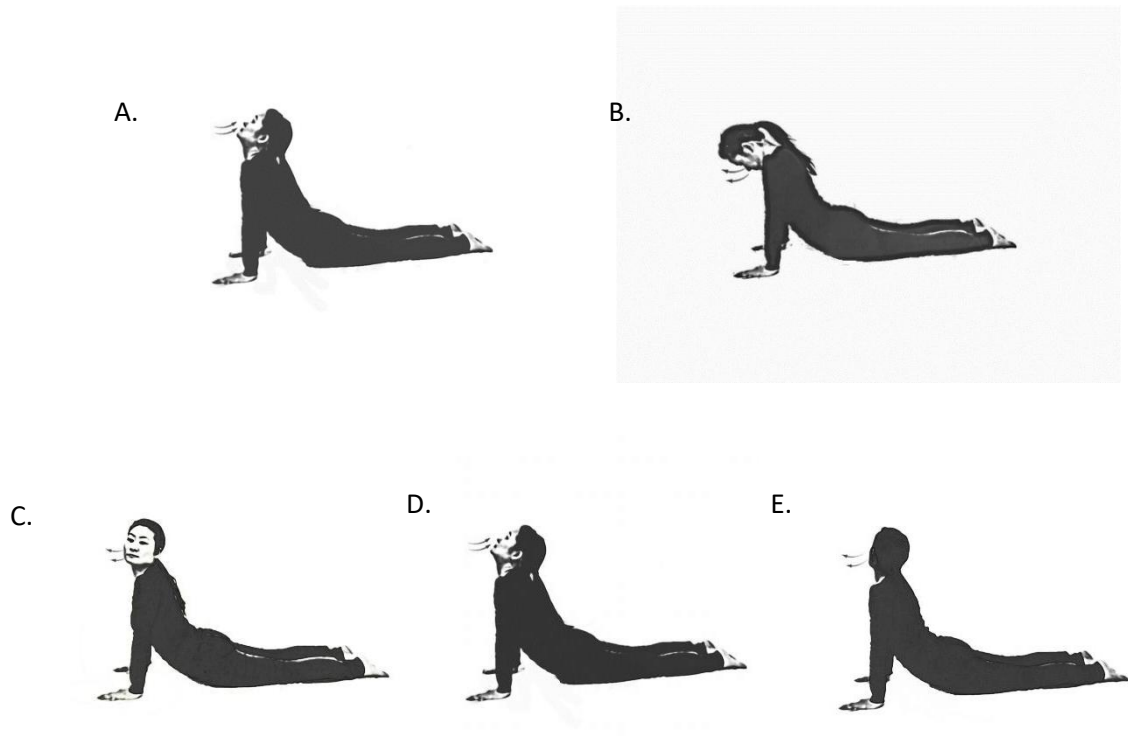


Figure 6: Illustration of step 5 in warm up exercises. From the prone position, the upper torso is lifted above the floor by straightening the arms and stretching the legs back, with the tops of feet on the floor. A and B: First 2 breathing cycles, where the neck is extended or head is tilted back on inhalation and on exhalation the head is tilted forward or neck flexed. C and D: In the next 2 breathing cycles, the neck is twisted alternately on right and left side. C. Neck is twisted to the left side on exhalation. D. Reversal of previous neck twist on inhalation. E. Neck is twisted to the right side on exhalation.

***Surya namaskar* - Sun salutation**

Surya namaskar (Sun salutation) is a sequence of twelve movements, linking postures and breathing exercise in a series. The postures are ordered in such a way, where the spine is stretched

backwards and forwards, alternatively. Similarly, each posture is also ordered with alternate inhalation and exhalation, except for the sixth asana, where the breath is held in an external suspension.

Step 1: *Pranamasana* - Prayer pose



Figure 7: Illustration of step 1 in sun salutation. Feet are brought together in basic standing position and hands are placed in front of the chest in a prayer posture.

Step 2: *Hastha uthanasana* - Raised arms pose



Figure 8: Illustration of step 2 in sun salutation. On inhalation, both arms are raised above the head and the neck is extended.

Step 3: *Padahastanasana* - Hand to foot pose



Figure 9: Illustration of step 3 in sun salutation. On exhalation, the upper part of body is stretched downwards by bringing the hands down and fingers trying to touch the ground. This is an inverted standing position.

Step 4: *Aswa sanchalanasana* - Equestrian pose



Figure 10: Illustration of step 4 in sun salutation. A sitting position is adopted on inhalation by backward stretching and extending of the right leg to the maximum. The left knee is bent and the

placement of left foot remains unaltered. The arms should remain straight supporting the weight of the body in extended neck position.

Step 5: *Parvatasana/Adhomuka svanasana* - Mountain pose/Downward stretch dog



Figure 11: Illustration of step 5 in sun salutation. On a deep exhale, the left leg is extended and stretched backward, in alignment with the right leg and the hips are pushed toward the ceiling, allowing the body to form an inverted V-shape. The arms are straight and the fingers are open like starfish, keeping the forefinger and thumb pressing down on the floor.

Step 6: *Nirkunjasana* - Ashtanga namaskar



Figure 12: Illustration of step 6 in sun salutation. Body is lowered to the floor/mat in such a way that the toes, knees, chest, hands, and forehead should be touching the floor. However, abdomen should be slightly raised off the floor and the breath is suspended in this position.

Step 7: *Bhujangasana* - Serpent pose

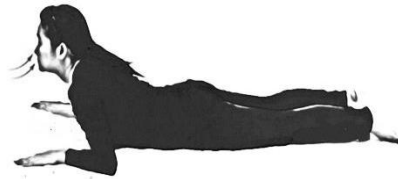


Figure 13: Illustration of step 7 in sun salutation. On a deep inhalation, the upper body is allowed to stretch/swing forward, lifting the chest and chin up, keeping the elbows close to the body. The lower part of the body is firmly on the ground.

Step 8: *Parvatasana/Adhomuka svanasana* - Mountain pose/Downward stretch dog



Figure 14: Illustration of step 8 in sun salutation. On a deep exhale, the left leg is extended and stretched backward, in alignment with the right leg and the hips are pushed toward the ceiling, allowing the body to form an inverted V-shape. The arms are straight and the fingers are open like starfish, keeping the forefinger and thumb pressing down on the floor.

Step 9: *Aswa sanchalanasana* - Equestrian pose

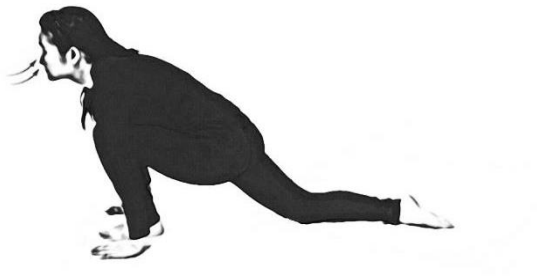


Figure 15: Illustration of step 9 in sun salutation. A sitting position is adopted in next inhalation by bringing the right leg forward in between the hands. The arms remain straight with neck in extended position.

Step 10: *Padahastanasana* - Hand to foot pose



Figure 16: Illustration of step 10 in sun salutation. Inverted standing position is achieved by bringing the left leg close to right leg on exhalation.

Step 11: *Hastha uthanasana* - Raised arms pose



Figure 17: Illustration of step 11 in sun salutation. On inhalation, both arms are raised above the head and the neck is extended.

Step 12: *Pranamasana* - Prayer pose



Figure 18: Illustration of step 12 in sun salutation. Feet are brought together in basic standing position and hands are placed in front of the chest in a prayer posture.

Surya namaskar exercises are performed, either as a long or a short cycle. Long cycle is the generally practiced as 12 sequence movements (Figure 19.A). Short cycle (Figure 19.B) is a shortened variation of the normal 12 sequenced surya namaskar.

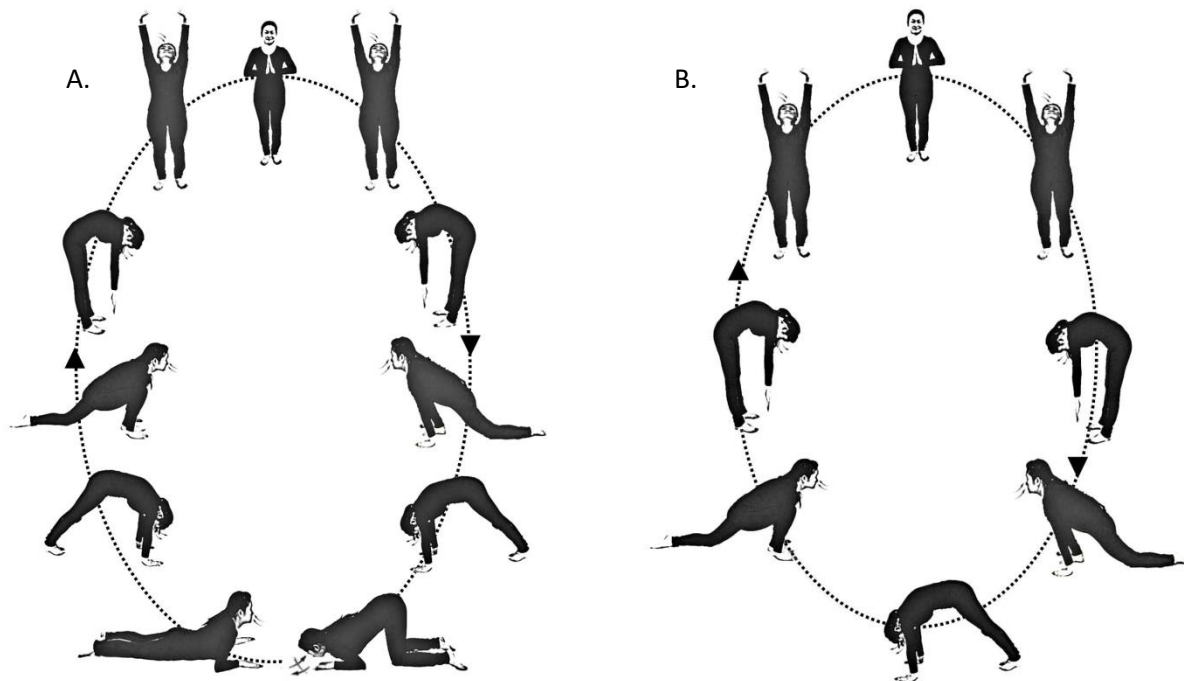


Figure 19: Illustration of long and short suryanamaskar. A. Sequences of long surya namaskar.
B. Sequences of short surya namaskar.

Following the warm up exercises and surya namaskar, the participants were asked to perform yoga postures. Details of the postures are summarized below.

ASANAS - POSTURES:

1: *Utkatasana* – Chair pose (Iyengar B. K., 2006 (first published in 1966))

‘Utkata’ means powerful, fierce, and uneven. This asana is like sitting on an imaginary chair.

Pre-position/Preparatory position:

Tadasana – Mountain pose: Erect standing position with feet together and hands, by the side of the thighs.

Pose:



Figure 20: Illustration of *Utkatasana* – Chair pose. On inhalation, legs are placed one foot apart and arms are raised straight in front, up to the shoulder level, with palms facing down. The final

posture is achieved by bending the knees, so that the thighs and arms are parallel to each other and to the floor, during exhalation. Stooping forward is prevented by straightening the chest and encouraging normal curvature of the spine. The breathing cycle is brought to normal and the posture is maintained for 30 seconds.

Posture release:

To come back to normal standing position legs are straightened and arms are lowered during inhalation.

2: *Vakrasana* – Upper spine twisting pose

‘*Vakra*’ means twisted. In this asana, the upper part of the body is twisted and the spine and the back muscles are stretched.

Pre-position:

Dandasana – Staff pose: It is done in seated position with the legs extended forward and palms rested on either side of the body. The upper body should be extending upward through the crown of the head, and the back should be completely perpendicular to the floor (as though sitting against a wall).

Pose:



Figure 21: Illustration of Vakrasana – Upper spine twisting pose. This pose is accomplished by placing the sole of the bent right knee, besides the left knee. The right hand is placed back at a distance of roughly 9 inches away from the spine and the left hand is placed at the other side of left knee. The head is twisted towards backside and gaze is focussed at backside. The posture is maintained for 30 seconds and is repeated on the other side.

Posture release:

To come back to sitting position release the head followed by the hands and then the leg.

3: Variation of *Yoga mudra* - Downward child posture with arm extension

Pre-position:

Kneeling down on the floor and hands placed by the side of the thighs.

Pose:



Figure 22: Illustration of variation of *Yoga mudra* - Downward child posture with arm extension. On exhalation, crown of the head is placed on the floor and the fingers are interlaced behind the lumbar region of the spine. The arms are stretched forward and the wrists are rotated forward and outward, during inhalation. The posture is maintained for 30 seconds, with normal breathing cycle and attention is focused on the shoulder blade and wrist.

Posture release:

The posture is released by counter rotation of the wrist joint, followed by the shoulder joint, placing the palms on the ground and the head is lifted off the ground.

4: *Marjariasana* – Cat yoga pose

Pre-position:

Kneel down on the floor and position the hands, directly beneath the shoulders and place the knees, beneath the hip.

Pose:

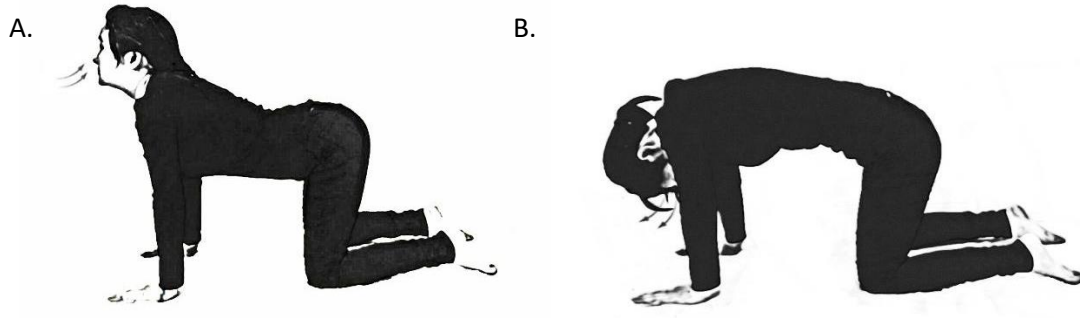


Figure 23: Illustration of *Marjariasana* – Cat yoga pose. A. On inhalation, the muscles of the abdomen are pulled and the spine is arched towards the ceiling. The arms are kept long, in line, and perpendicular to the floor. Attention is placed on the navel throughout the sequence. B. On exhalation, spine reversal is achieved by bringing the neck towards the collar bone. The sequence is repeated two to five times.

Posture release:

To release from this posture, the chest is made to rest on the knees or allowing the chest to go between the knees, with the body facing the floor in a foetal position. The head is stretched forward towards the ground; the forehead may touch the ground. The arms may be stretched forward in front of the head or backwards towards the feet.

5: *Bharadvajasana* – Upper torso twist

Pre-position:

Dandasana – Staff pose: Begin in seated position with the legs extended forward and palms rested on either side of the body. The upper body should be extending upward through the crown of the head, and the back should be completely perpendicular to the floor (as though sitting against a wall).

Pose:

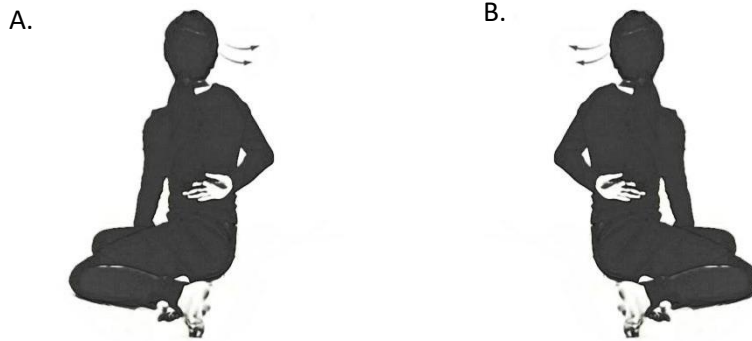


Figure 24: Illustration of *Bharadvajasana* – Upper torso twist. From the preparatory position the legs and feet of the bent knees are placed on the left side of the hips during inhalation. Left leg shin is placed across the top of the right foot arch. A. On exhalation, the upper trunk is directed right, left hand is placed outside the right knee and right hand is attempted to hold the left upper arm. The spine is kept erect and maintained perpendicular to the pelvis. The posture is maintained for 30 seconds. B. The same posture is repeated on the opposite side.

Posture release:

Hand grip is released and legs are straightened.

6: *Matsyasana* - Fish pose

Pre-position:

Supine position- Lying down with the face up and arms placed close to the body.

Pose:

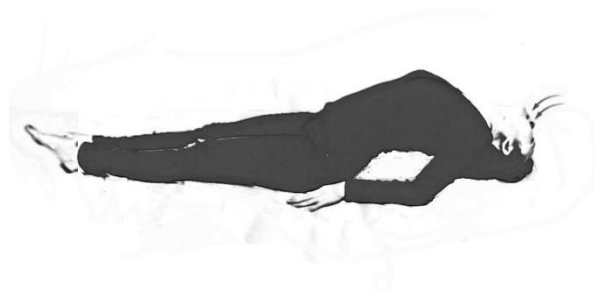


Figure 25: Illustration of *Matsyasana* - Fish pose. With the support from the elbows, chest is lifted slightly and the head is tilted backward, so the crown of the head is placed on the ground during inhalation. The arch is deepened by lifting the chest and neck up. The posture is maintained for 30 seconds with normal breathing cycle.

Posture release:

Head is straightened and elbows are released to touch back to the ground.

7: *Urdhva Janu sirasana* – Upward facing single leg forward bent knee posture

In Sanskrit, the word *urdhvamukha* means looking up. This asana is a creative adaptation of the classic posture, forward head to knee pose. In this version, the back is erect and the head is tilted back. The eyes gaze upwards synchronized with the upward movement of the head.

Pre-position:

Dandasana – Staff pose: Begin in seated position with the legs extended forward and palms rested on either side of the body. The upper body should be extending upward through the crown of the head, and the back should be completely perpendicular to the floor (as though sitting against a wall).

Pose:

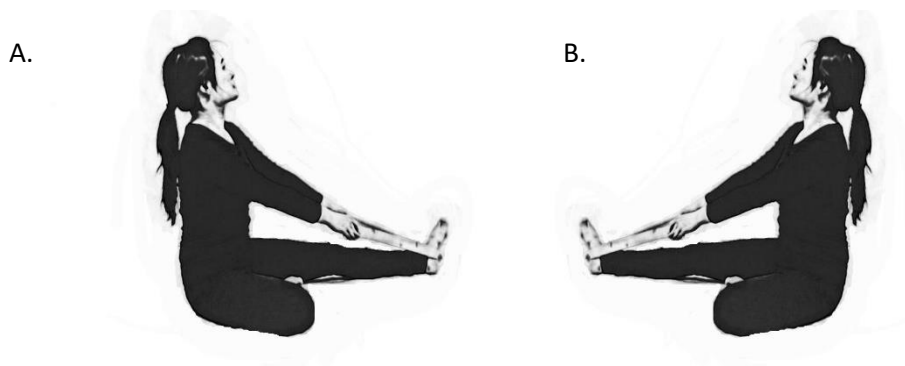


Figure 26: *Urdhva Janu sirasana* – Upward facing single leg forward bent knee posture. A. The right knee is bent, so that the sole of right leg touches the left thigh. The arms are straightened and stretched up to the shoulder level. The torso is held upright by pulling a belt or a wide cloth, wound around the left upper heel, with the help of hands. The head is tilted back maintaining normal breathing. The posture is maintained for 30 seconds. B. The same posture is repeated on the opposite side.

Posture release:

Hand grip is released and the legs are straightened.

PRANAYAMA

Sit in a comfortable sitting position with legs folded inwards for all breathing and meditative practices.

1: Deep breathing:

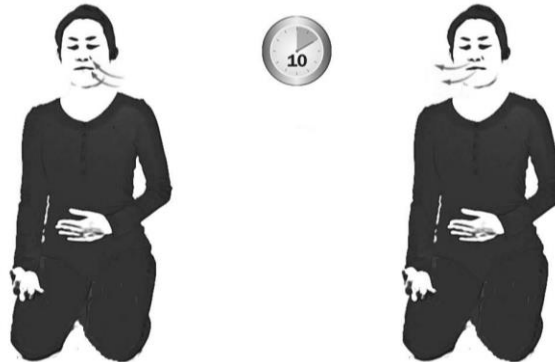


Figure 27: Illustration of Deep breathing. Deep breathing involves slow and deep inhalation through the nose, usually for 10 to 15 seconds, followed by a slow and complete exhalation for a similar time. Diaphragmatic breathing is achieved by drawing air into the lungs in a way, which will expand the stomach only, but not the chest. A period of 10 second rest is given at the end of each exhalation and the process is repeated for 5 times.

2: *Bhastrika* - Bellows Breathing

A Technique in which the breath is forcefully inhaled and exhaled using strong abdominal muscle contractions.

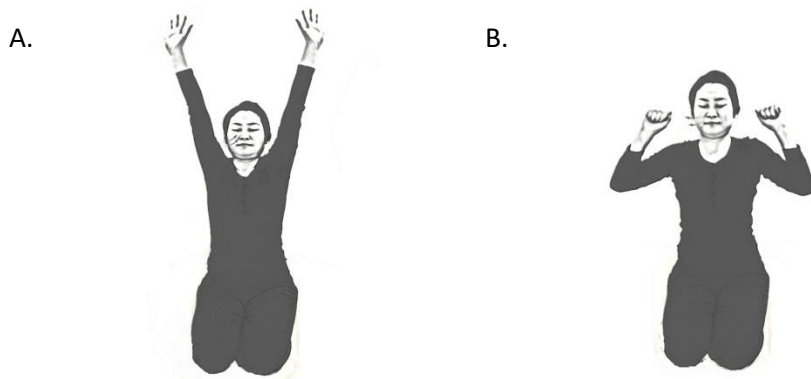


Figure 28: Illustration of *Bhastrika* - Bellows Breathing. Bhastrika is done through the nostrils with the eyes closed at a rate of approximately 30 breaths per minute. A. During inhalation the arms go straight upwards; the hands open with the fingers extended. B. During exhalation the elbows are brought down with the hands closed. Three rounds of Bhastrika with 15 – 20 breath cycles each are followed by a resting period of 20 seconds in between rounds.

3: *Mukhasan*

step 1

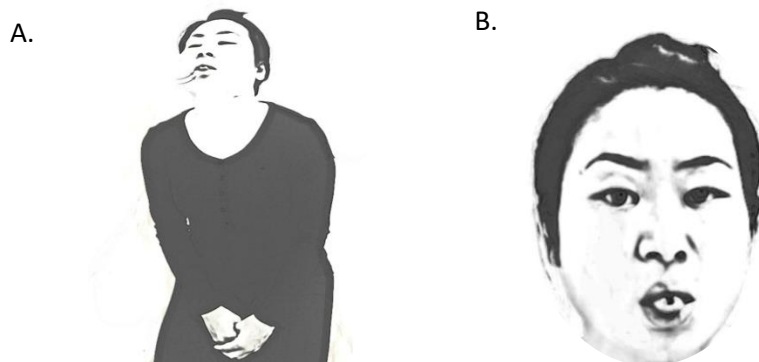


Figure 29: Illustration for sub step 1 of Mukshan. A. Keeping the neck stretched upwards, air is sucked into the lungs by curling the tongue in the form of a hollow tube and making a ‘hiss’ sound as if drinking air from the sky. B. Close view of the curled tongue.

step 2



Figure 30: Illustration for sub step 2 of Mukshan. .. Following maximum inhalation, the neck is bent downwards to bring the chin close to the chest. Ensuring that no air leaks out of the nose or mouth with lips touching together tightly closed and cheeks blown outwards with an air bolus inside the mouth, simple jaw movements are performed. These jaw movements include, chewing an air bolus without teeth contact, followed by protrusion, retrusion, lips-together opening, closing and lateral movements Air is retained in an inhaled state for a period of time which is approximate to the completion time for all jaw movements or to the retention capacity of the individual.

Step 3



Figure 31: Illustration for sub step 3 of Mukshan. On completion of the jaw movements or when discomfort is felt retaining the inhaled air, the neck is extended upwards and the air is exhaled out through the mouth forcefully.

Steps 1 to 3 are repeated 3- 5 times with a rest of 15 seconds between each round.

4: Nadi Shuddhi - Alternate nostril breathing without retention

A.



B.



Figure 32: Illustration of *Nadi Shuddhi* - Alternate nostril breathing without retention.

Pranayama mudra - Breathing hand gestures: Pad of left thumb and left forefinger are made to join each other and the palm of left hand is placed facing down on the thigh. Right hand gesture is synchronised with the breathing cycle: A. Thumb opening or closing the right nostril and B. Left nostril is manipulated by ring finger and or little finger. One cycle of alternate nostril breathing involves inhaling air through one nostril and exhaling through the other. Then the nostril used for exhalation will be used for the next inspiration, and exhalation will be through the previously inhaled nostril. The process is repeated 3-5 times with a resting period of 20 seconds between cycles.

5: *Shanmukhi mudra*



Figure 33: Illustration of *Shanmukhi mudra*. Air is inhaled through the nostrils and retained in the lungs. During internal retention of the breath, the sense organs of the face are closed with the fingers in the following manner: the thumbs close the ear openings, the index fingers close the eyelids, the middle fingers close the nostrils, the ring fingers are above the upper lip and the little fingers below the lower lip.

Sub steps of *Shanmukhi mudra*:

1. Raise the hands close to the face and lift the elbows to the level of the shoulders; place the thumbs on the ear-openings, so as to stop any external sounds. This is done by pushing and holding the tragus (the small prominence at the entrance of the external ear over the ear-openings) with the thumbs.
2. Close the eyelids, but turn the eyes up. Place the index and middle fingers on the closed lids, so that only the first two phalanges are pressing the entire eyeball. However, do not press the cornea. Pull the eyelids down with the middle finger. Push the upper part of the eyelids, below the eyebrow, upwards with the index finger. Gently press the eyes at both the corners.

3. Equal pressure should be maintained on the ears and the eyes.
4. With the tips of the ring fingers press both nostrils equally. The flares of the nasal passages are thus narrowed for slow, deep, steady, rhythmic, and subtle breathing.
5. Stay in this position as long as you can, drawing the mind's attention inwards.

6: *Bhramari* – Humming bee breath



Figure 34: Illustration of *Bhramari* – Humming bee breath. *Bhramari* is a breathing technique that produces a vibrating sound, upon exhalation through the nostrils. Elbows are raised horizontally to the level of the shoulders. The lips seal the mouth, the thumb depresses the tragus to close the ear, and the eyelids are closed. The index finger is placed over the forehead along the eyebrows and the middle finger is placed at the base of the nose near the corners of the eyes. The ring and little fingers are placed along the slopes of the nose as shown in the figure. Air is inhaled through the nostrils and on exhalation, a sound is generated which is similar to the humming of a bee, having a constant pitch. A period of 10 second rest is given at the end of each exhalation and the process is repeated for 3 times.

7: *Dhyana* – Meditation



Figure 35: Illustration for *Dhyana* - meditation.

Variations of *Dhyana* – Meditation:

1. *Dhyana* - Mindfulness meditation

This type of meditation involves focusing the mind's concentration and breathing to different objects/bodily parts. Instructions are given to move the awareness to different regions of the head and neck by the instructor.

2. *Dhyana with Kechari Mudra* - Meditation with inward tongue position:

In the second visit, before starting up the meditation, participants are instructed to roll the tongue inwards. Thus, the tip of the tongue can touch the end of the hard palate and the mandible is in the maximum retrusive position. Mouth is closed with upper and lower teeth slightly (may be a cm or two) apart. Instructions are given to focus on different parts of head and neck with more emphasis on the TMJ.

3. “Om” Dhyana – Omkara Meditation:



Figure 36: Illustration of “Om” Dhyana – Omkara Meditation. In the third visit during meditation session, all participants chanted OM on each exhalation. They were encouraged to prolong the chant by controlled, deep, and slow exhalation.

References

- Andiappan, A. (2004). *Thirumoolar's Ashtanga Yoga - a therapeutic approach to good health*. Chennai.
- Bhutada, M. (1994). *Yoga for Health*.
- Iyengar, B. (2007). *YOGA: The Path to Holistic Health*. DK Publishing.
- Iyengar, B. K. (2006 (first published in 1966)). *Light on Yoga: Yoga Dipika* .
- Muktibodhananda, S. (2006). *Swatmarama, Y. (n.d.). The therapeutic aspect Hatha Yoga Pradipika*. Bihar, India: 17-19: Yoga Publications Trust.